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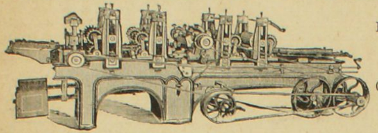

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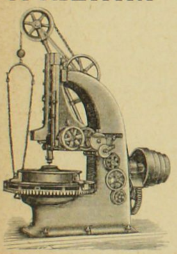

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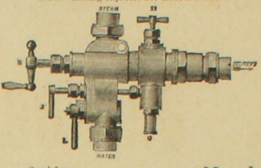

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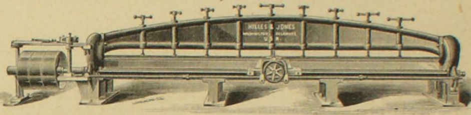

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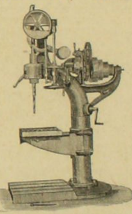

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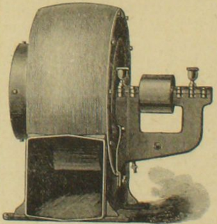

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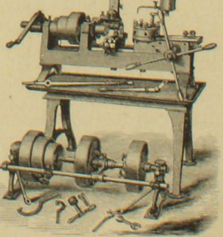

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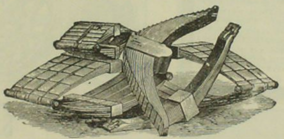

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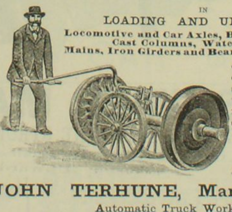

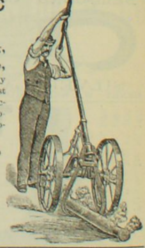

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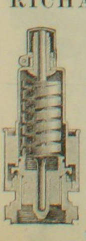

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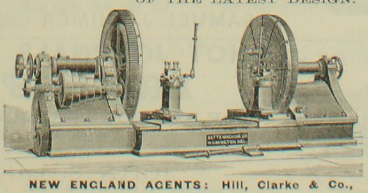

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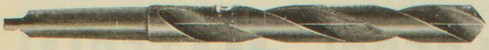

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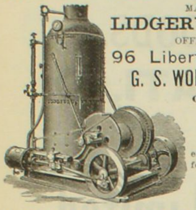

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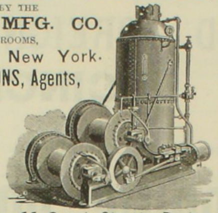

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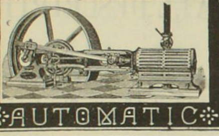

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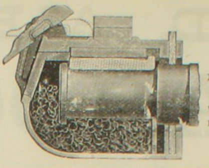

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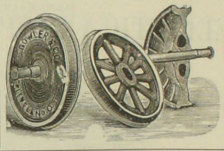

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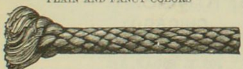
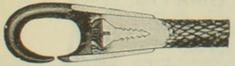


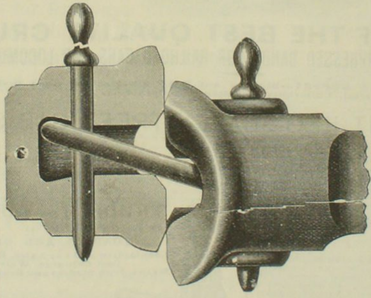
BELL-CORD COUPLINGS.



MANUFACTURED BY

SILVER LAKE CO.

HENRY W. WELLINGTON, Agent, BOSTON



SAFFORD'S SAFETY DRAW-BAR.

"VICTORY OVER MORE THAN 30 CONTESTANTS."

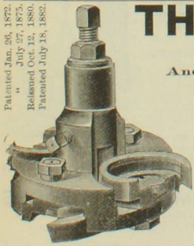
Victory over more than 30 Self-Couplers in the Master Car-Builder's Convention of June, 1876. Also indorsement for safety in coupling by the Yard Masters, in their Convention, June, 1877, and by 300 others who were unable to attend the Convention, and 300 railroad officials who are resident in 26 States, and who admitted superiority over any other yet produced. Try 30 free of royalty, and see for yourself! Pattern free, and no change in timbers or connections. Those made by Wilson, Walker & Co., Pittsburgh, Pa., *will save 200 per cent. in repairs*, and give double life service over *old styles of* wrought iron. About 43,000 in use by 146 railroads. The *saving in repairs* by using *my invention* is from 20 per cent. to 80 per cent. as per *report o many officers.*

J. B. SAFFORD,

EAGLE IRON WORKS

BUFFALO, N. Y.

Patented Jan. 26, 1872.
" July 27, 1875.
Reissued Oct. 12, 1880.
Patented July 18, 1882.

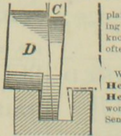


TONGUE HEAD.

THE SHIMER MATCHER HEADS.

THE CHEAPEST! THE STRONGEST! THE MOST DURABLE!

And yet the Lightest and Easiest Running Matcher Heads in the World. Upward of 12,000 Sold.

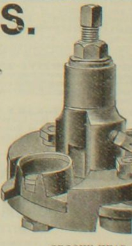


The Bits are arranged in upper and lower series, and secured to a Head having seats alternately inclined for the purpose of giving the side clearance to their cutting points. This explains why these Bits hold their shape and turn out standard work until used up; the entire circle of Bit being tool cutting edge.

This diagram represents a Bit (*D*) in the position it occupies when making a cut: the Bit (*C*) which follows to complete the work is given in outline. This explains the division of cut and the free and easy working of the Tool. They finish hard cross-grained and knotty lumber neatly, showing clean-cut edges and often *save their cost in one day's run.*

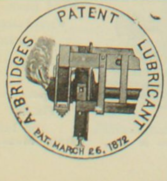
We also make **Ship Lap Heads, Jointer Heads, Dado Heads, Sash Heads, Door Heads, Cope Heads** and Heads for any special work where a perfectly uniform pattern is required. Send for Descriptive Circular.

SAMUEL J. SHIMER (Successor to Shimer & Co.), Milton, Penn.



GROOVE HEAD.

Patented Jan. 26, 1872.
" July 27, 1875.
Reissued Oct. 12, 1880.
Patented July 18, 1882.



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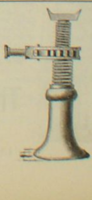

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MANUFACTURERS OF
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Best Chilled Iron
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MANUFACTURED BY
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MANUFACTURERS OF
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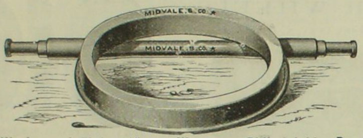

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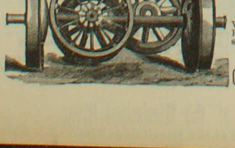

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CAR WHEEL WORKS,
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Manufacturers of CAR WHEELS of all descriptions, Wheels and Axles, Chilled Tires; Engine, Car and Bridge Castings, of any pattern, furnished to order at short notice. Wheels of all sizes constantly on hand.
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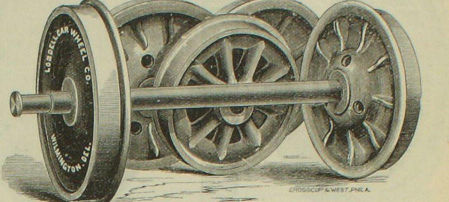

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Single and Double Plate and Hollow Spoke Wheels for Steam Roads. Also, Solid and Open Plate Wheels for Street Roads.
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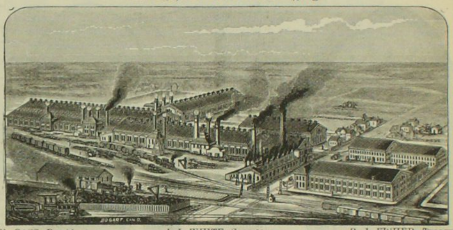

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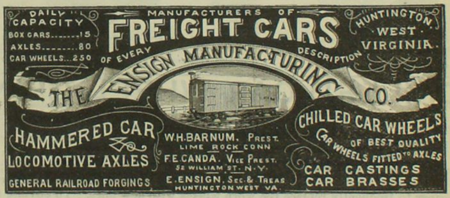

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THE HARLAN & HOLLINGSWORTH CO.,
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Established in - - - - - 1836.

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FROM 1-4 TO 15,000 lbs. WEIGHT.
True to pattern, sound and solid, of unequaled strength, toughness and durability. An invaluable substitute for forgings or cast-iron requiring three-fold strength. Gearing of all kinds, Shoes, Dies, Hammer-Heads, Cross-Heads for locomotives, etc. 40,000 Crank Shafts and 30,000 Gear Wheels of this steel now running prove its superiority over other steel castings. CRANK SHAFTS, CROSS-HEADS and GEARING specialties. Circulars and Price Lists free.
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Is best applied as a dope by mixing well with waste saturated with oil, and packing close to the journal.

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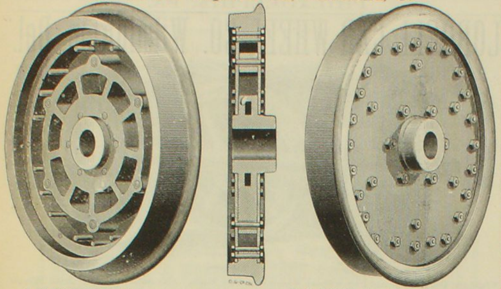

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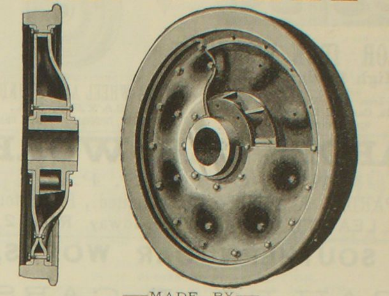
Adapted for Sleeping and Drawing Room Cars, Locomotive and Tender Trucks. Steel Tires, four inches thick, with ½ inch Plates, securely bolted, making it a perfectly Safe, Durable and Noiseless Wheel.

THE STEEL TIRED SPRING PLATE CAR WHEEL

HAS NO RIGID CONNECTION BETWEEN TIRE AND AXLE.



IS LIGHT, STRONG AND CHEAP.

SEND FOR CIRCULAR.

—MADE BY—

The Dickson Manufacturing Co.,

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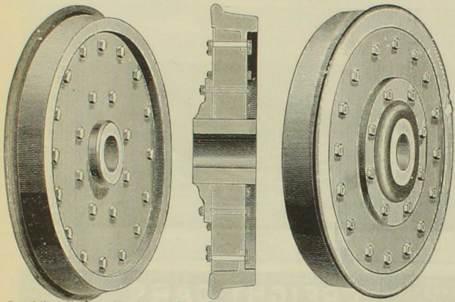
ALLEN PAPER CAR WHEEL COMPANY,

General Offices: 239 Broadway, N. Y.



PAPER CAR WHEEL.

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ALL SIZES.

Especially adapted for Sleeping and Drawing-Room Cars, Locomotive and Tender Trucks. Steel Tire with Annular Web—Strongest, Most Durable, and Most Economical Wheel in use. Works at Hudson, N. Y., and at Pullman (near Chicago), Ill.

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MANUFACTURERS OF

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P. O. Box 129,
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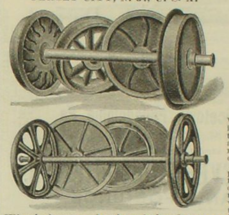
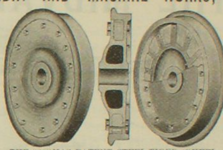


Wheels loose or fitted to Axles for every variety of Railroad Service.



THE THOMAS PATENT STEEL-TIRED WHEEL.

The above engraving represents a new Steel-Tired Car Wheel having practically an indestructible non-metallic bearing for the tire, of sufficient depth to intercept and destroy the vibrations common to ordinary chilled iron car wheels, and steel-tired wheels in which the tire rests directly upon a metallic centre, thus producing a noiseless wheel and one securing increased life for the tire and axle.

This is accomplished by casting a centre having a series of pockets or recesses on its circumference, **opening outward,** formed by the back plate of the casting extending to the top of the pocket, and the front plate to about half the height of the pocket, and separated from each other by radial metal walls. Into these pockets are forced from the periphery of the casting wedge shape blocks of wood, so treated that there is no possibility of shrinkage or deterioration. The wooden blocks before insertion are of such size that the pressure necessary to seat them secures their retention in the pockets when the pressure is removed, and when turned off to receive the tire they extend slightly beyond the radial walls, the tire thus bearing only on wood. To secure the tire to the centre, bolts pass through the internal flange and the radial walls, and, having a bearing in metal their entire length, hold more firmly than when allowed to pass in part through the cushioning material.

Attention is called to the wheel as one of few parts, to the facility with which it may be refitted with new tire, and that the life of the wooden bearing is measured by the number of times the casting will admit of refitting to axle.

The wheel is manufactured by The Jersey City Wheel Foundry and Machine Works.

For further information address THEODORE THOMAS, P. O. Box 129, Jersey City, N. J.

CHILLED CAR WHEEL GRINDING CO., CARSON, NEVADA.

Patented in United States and Canada.

H. M. YERINGTON, President. **A. C. ELLIS, Vice-President.** **G. F. FORD, Secretary and Treasurer.**

The CHILLED CAR WHEEL GRINDING MACHINE, which we now introduce, is no hasty device. It is the result of four and one-half years experience, and during that time has received a most thorough test, with satisfactory results.

Railroad officials, upon reflection, will admit it is more essential to have a machine to true up Chilled Car Wheels than a Tire Lathe for turning locomotive tires, for this reason: four or more driving wheel tires are required for one engine; a greater number of Car Wheels compose a train; hence the necessity of this invention.

The great hardness of the chilled tread has hitherto rendered the operation of turning them impracticable, owing to the great expense, which made it cheaper to frequently replace the worn wheels with new ones. To obviate these objections and reduce the cost of this process, we furnish a machine capable of making a perfect wheel at small expense.

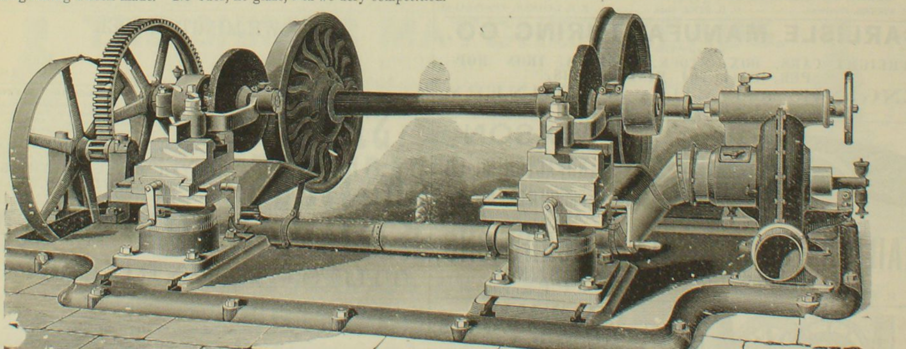
Wheels with flat places, and otherwise badly worn, that are ordinarily condemned and used for scrap iron, can be ground and fitted so as to double their original mileage. This alone makes our machine the greatest money saver ever introduced to railroads.

A sound Chilled Car Wheel trued by our method cannot be excelled by a paper or any other description of Car Wheel with steel tire.

Any person having a slight acquaintance with tools may, after five hours' instruction, become thoroughly competent to operate our machine.

Allowing all new wheels to be 3-32 inch oval, if properly fitted to axles, our machine *will* true up one pair an hour.

We manufacture expressly for use with our machine, Abrading Wheels, which, as the result of a series of experiments and long experience, we guarantee to be the best grinding wheels made. No odor, no glaze, and we defy competition.



Central Pacific Railroad,
Chicago & Northwestern Railway,
Chicago, Rock Island & Pacific Railway,
Virginia & Truckee Railroad,
Pennsylvania Railroad,
Denver & Rio Grande Railway,
Chicago, Milwaukee & St. Paul Railroad.
Canadian Pacific Railroad (Yale B. C.),
Chicago City R. R., Cable Road,
New York & New England Railroad,
Union Pac. Ry. (Denver & S. Park Div.),
South Pacific Coast Railroad,
Nevada County Narrow Gauge Railroad,
Chicago City Railway (South Division),
New York, Ontario & Western Railway,
Utah Cent. Railway,
Lehigh Valley Railroad,
Pullman Palace Car Company,
Allegheny Valley Railroad,
Chicago City Railway (West Division),
Carson & Colorado Railroad,
Lake Tahoe Narrow Gauge Railroad,
J. Harris & Co., St. Johns, N. B.
A., T. & S. Fe Railway,
Baltimore & Ohio Railroad,
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New Brunswick Wheel Foundry Johns, N. B.
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We are prepared to sell machines outright, or to furnish them on royalty for each pair of wheels trued.

THE ALLENTOWN ROLLING MILLS, Allentown, Pa., Manufacturers and Financial Agents East of the Mississippi River.

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THE BALTIMORE CAR WHEEL COMPANY,

MANUFACTURERS OF

CHILLED WHEELS OF ALL PATTERNS AND SIZES, FOR EVERY SERVICE, AND WITH OR WITHOUT AXLES.

CAPACITY, 400 WHEELS PER DAY.

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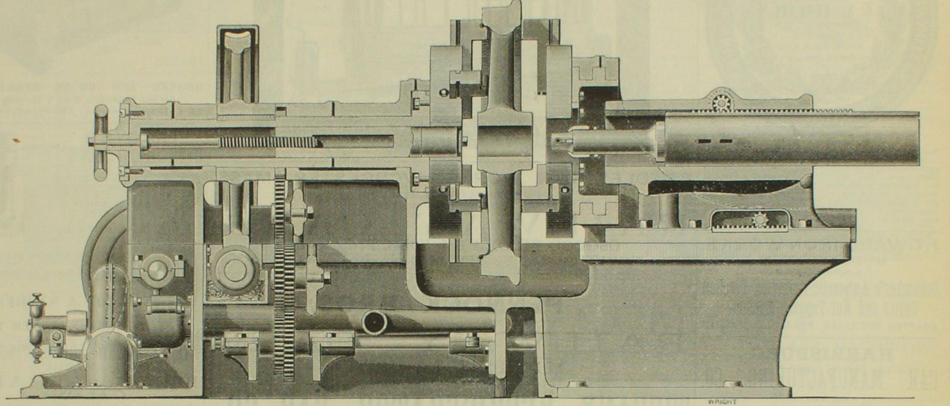
OFFICE AND WORKS Fulton Junction, Baltimore, Md.

Combination Car Wheel Boring, Grinding, Truing and Turning Machine.



RAILWAY CAR WHEEL ECONOMY.

The long-felt want of a machine having greater capacity and accuracy for operating upon every construction, "including new and worn wheels withdrawn from service," is herewith represented, and will be placed for parties ordering the same upon a guarantee in writing. After a test, should it fail to have greater capacity and accuracy than *any* other tool, we agree to *remove it free of charge.*

It will bore the axle seat, turn the tread and flange of any steel or steel-tired wheel simultaneously.

It will centre any steel or steel-tired wheel by its already bored axle seat, turn the tread and flange in less time than any tool in existence.

It will *bore* and *true* a chilled iron wheel in less time, removing less chill therefrom, than any tool or system of tools for such purpose.

It is built first-class, well proportioned for its work and occupying a floor space of 10 × 7 feet.

GUARANTEED CAPACITY IN 10 HOURS:

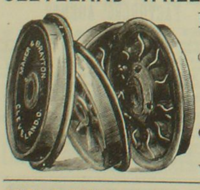
No. 30.—New Chilled Iron Wheels, 33 inches diameter, bored, ground and paired if 1/8 inch defective.
No. 15.—New Chilled Iron Wheels, 42 inches diameter, bored, ground and paired if 3-16 inch defective.
No. 6.—New Steel or Steel-tired Wheels, 33 inches diameter, bored, turned and paired if 1/2 inch defective.
No. 4.—New Steel or Steel-tired Wheels, 42 inches diameter, bored, turned and paired if 5/8 inch defective.
No. 6.—Worn Steel or Steel-tired Wheels, 33 inches diameter, centered, turned and paired if 1/2 inch defective, tread and flange.
No. 4.—Worn Steel or Steel-tired Wheels, 42 inches diameter, centered, turned and paired if 5/8 inch defective, tread and flange.

Special Abrading Wheels of Superior Quality, for Chilled Iron Surface, Car-Wheel Grinding and General Shop Use Guaranteed.

For further particulars address

M. C. BULLOCK MANUFACTURING COMPANY, 199 LAKE STREET, CHICAGO, ILL.

CLEVELAND WHEEL AND FOUNDRY WORKS,



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MANUFACTURERS OF

CAR, ENGINE, TRUCK AND TENDER WHEELS, RAILROAD, ROLLING-MILL AND MACHINERY CASTINGS, AND STREET RAILROAD WHEELS AND TURNOUTS.

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KNOXVILLE CAR WHEEL CO.,

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MANUFACTURE

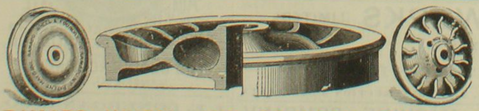
CHILLED WHEELS FOR CARS,

ENGINE TRUCKS AND TENDERS,

USING STRICTLY

COLD BLAST CHARCOAL IRON,

Made at their Celebrated Carter Co. Furnaces.



RAMAPO WHEEL AND FOUNDRY COMPANY,

MANUFACTURERS OF

Chilled Wheels for Drawing-Room and Sleeping Coaches, Locomotives, Tenders, Passenger and Freight Cars.

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RAMAPO, ROCKLAND COUNTY, N. Y.

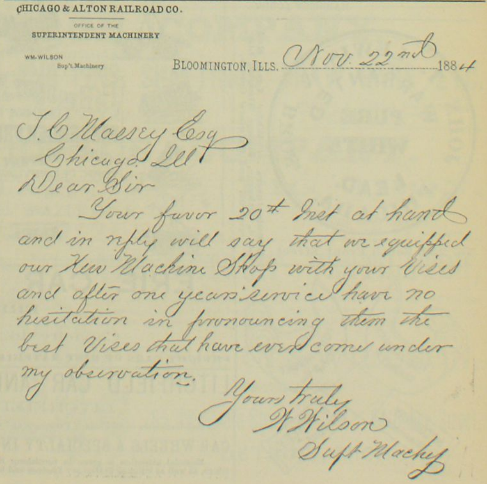
DAVENPORT & FAIRBAIRN,

ERIE, PA.

MANUFACTURERS OF

CAR WHEELS.

Capacity 350 Wheels per day. Wheels made by improved process. Far more durable than those made in the ordinary way.



CHICAGO & ALTON RAILROAD CO.

OFFICE OF THE
SUPERINTENDENT MACHINERY

WM. WILSON
Sup't. Machinery

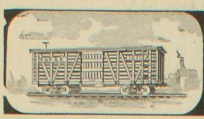
BLOOMINGTON, ILLS. Nov. 22nd 1884

T. C. Massey Esq
Chicago Ill
Dear Sir

Your favor 20th Inst at hand and in reply will say that we equipped our New Machine Shop with your Vises and after one years' service have no hesitation in pronouncing them the best Vises that have ever come under my observation.

Yours truly
W. Wilson
Supt Machy

B. F. MASTEN, PREST. C. E. GORE, SUPT.



LA·FAYETTE·CAR·WORKS
LA FAYETTE, IND.
FREIGHT, CABOOSE & REFRIGERATOR CARS. OF·ALL·KINDS·
PUSH CARS HAND &
WAREHOUSE TRUCKS & BAGGAGE BARROWS. CAR WHEELS & CASTINGS

TIFFANY SUMMER & WINTER CAR.
LA FAYETTE CAR WORKS
REFRIGERATOR LINE.

NATIONAL EXPOSITION OF RAILWAY APPLIANCES. CHICAGO 1883.
SILVER MEDAL
AWARDED TO
E. L. BUSHNEL
Po'keepsie, N. Y.
FOR THE BEST
SEAT, BACK AND
BERTH SPRINGS

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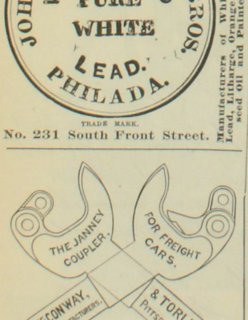
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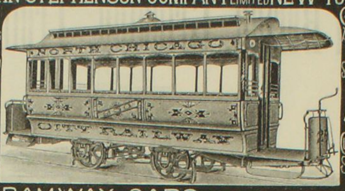

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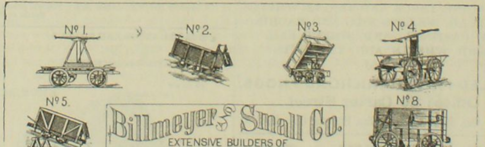

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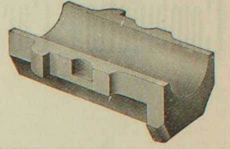

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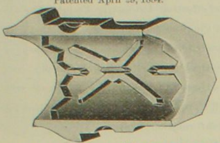

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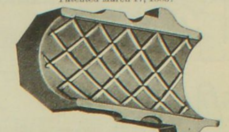

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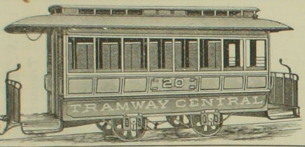

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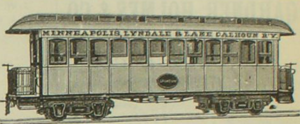
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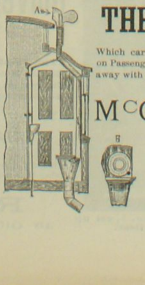

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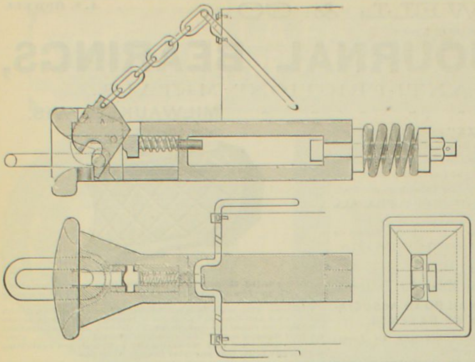

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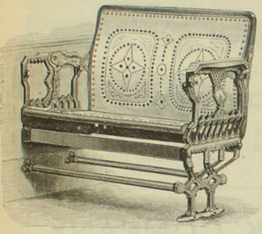

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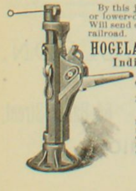

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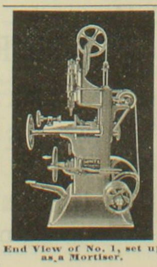

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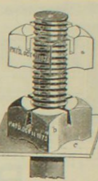

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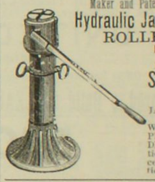

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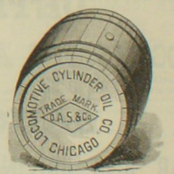

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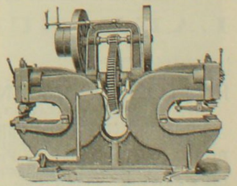

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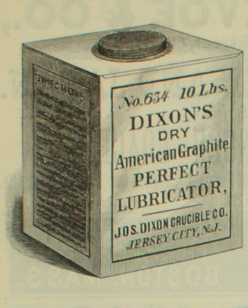

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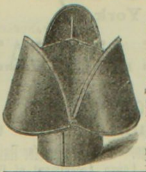

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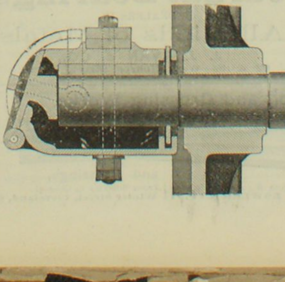

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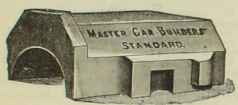
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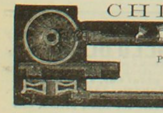

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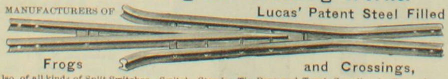

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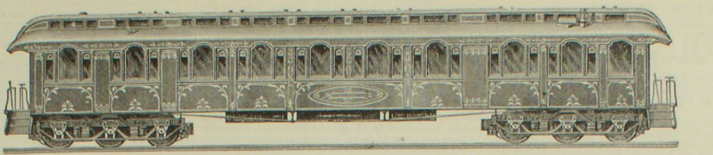

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VOLUME XVI.
NUMBER 8.

AUGUST, 1885.

SINGLE NUMBERS, TEN CENTS,
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Miscellaneous Items.

THE Westinghouse Air Brake Co. has received an order from the Chicago, Burlington & Quincy road for 400 additional sets of automatic freight car brakes. When this order is completed, this road will have 520 sets of these brakes in use. They are said to be giving very good results.

APPAVOO, CHETLY & SONS, native car-builders, who carry on an extensive business in Mysore, India, have entered upon the construction of a new style of sleeping car, specially adapted for the requirements of Indian travel. Specimen cars will be exhibited at the London International Exhibition next year.

THE strongest wood in the United States is that of the nutmeg hickory of the Arkansas region, and the weakest the West Indian birch. The most elastic is the tamarack, the white or shellbark hickory standing far below it. The highest specific gravity, upon which in general depends value as fuel, is attained by the blue wood of Texas.

THERE was some fast running on the West Shore road July 9. A special train consisting of engine and tender and one baggage and two private cars, made the run from Buffalo to Frankfort, 205 miles, at the rate of 59.63 miles per hour, not including stops. The engines used were Nos. 45 and 50, and were built at the Rogers Locomotive Works, each running half the distance.

AN excursion train, containing idiots from a lunatic asylum, recently passed over the Chicago, Burlington & Quincy road, and they were mistaken for a party of Iowa editors. A reporter of a Galesburg paper went into a car to interview the crowd. As a preliminary he asked where they were going, and was promptly answered, to hell. He did not inquire further into their business.

PREPARATIONS are making on the New York Central road for scooping water instead of making stops at the tanks. The engines of fast freight and passenger trains are to be supplied in this way. The troughs will be constructed first at a point west of Palatine Bridge, and will be 1,200 feet in length. Scooping attachments have already been affixed to several of the road's locomotives.

THE Ames car coupler (combined hook and link) has been improved so as to require less alteration of cars for its use. The Boston & Albany has just put it upon 100 cars, and ordered it for 600. The Merchants' Dispatch has ordered it for 300, the Old Colony for 25, and the Union Tank Line and the Worcester & Nashua have put it on trial. The New York Central has just applied it to 100 cars.

AN ingeniously devised dumping car for carrying molten metal has been patented by J. M. Hartman, of Philadelphia, Pa. The body of the car is lined with fire-brick, and the top can be covered with cast-iron plates. It is in effect a large portable ladle, with unusually good provision for keeping the metal hot, and provided with mechanism that makes pouring easy and under perfect control of the workmen.

AN electric railway and power company has been organized in St. Louis, Mo. The projectors of the enterprise say that they are going to operate an elevated or surface railroad by means of electrical transmission of power. It is to be hoped there will be more action and less meaningless talk about it than there has been with the parties promising to operate the Brooklyn Bridge cars and the elevated railroad trains of New York with electricity.

FREIGHT is hauled on most of our railroads at such a low rate that craft on free water-courses can hardly compete with rail tariffs. Under this state of matters it is curious to read that a railroad has been compelled to lower its rates, owing to the competition of ox teams. Yet, in this year of grace, that is what the Canadian Pacific has been forced to do. The reduction was to $30 per ton for a haul of 160 miles. Some railroads in the United States would be glad to get one of the thirty dollars for the same haul.

THE Barney & Smith Manufacturing Co., Dayton, O., are completing 18 coaches and baggage cars for the Minnesota & Northwestern road; 3 parlor and 1 sleeping car for the New York Central Sleeping Car Co., and are rebuilding 4 sleepers for same company. They are also building 30 box cars for the Portage Straw-Board Co.; 20 palace horse cars for Arms & Co.; 4 passenger cars for the Gulf, Colorado & Santa Fe; 5 passenger and baggage cars for a Texas road, and have also a number of small orders in hand.

THE Chicago & Northwestern Railway Company is running fast freight trains between Chicago and Omaha on express passenger train time. The trains consist of twenty cars, equipped with the Westinghouse automatic air brake, and they are loaded with merchandise that has to be pushed through with as little delay as possible. No stoppages are made, except at water stations. While running on the time of the Denver passenger express recently, the engineer of the express freight train said he had to kill time going along.

ONE of the latest moves in the line of inventions for coupling cars is led by a South Carolina genius who claims to have invented a perfect system of car coupling by electricity. We have not received particulars of the apparatus or method employed to do the work of coupling cars, but we have seen some particulars of a recent trial as reported in a local paper. It said the freight train was cut in four pieces and coupled up without the aid of any person except the conductor, who did the entire work from the rear car.

RECENT experiments in Germany afford additional evidence of the practicability and economy of electric lighting for cars. The dynamo was driven from the axle of the luggage van. Besides the van, the train had a first, second and third class carriage, and was lighted by 12 incandescent lamps. The light was perfectly steady at variable speeds and during stoppages at stations. At the end of six weeks' running the apparatus was found in perfect order. The cost of the lighting is estimated at ten cents per lamp per hour. After awhile we shall have it. The indications are all favorable.

MR. WM. BUCHANAN, Superintendent of Machinery and Rolling Stock of the New York Central road, has recently been requested by a Western car-building establishment to furnish them with drawings of his new standard freight car truck, as a prominent railroad company had given an order for new box cars to be built with that truck. The truck was illustrated in the CAR-BUILDER of June last. Many master car-builders who talked of this truck round the convention said it was heavier than what was yet necessary, but a truck is a part where a large margin of strength often proves exceedingly convenient and safe.

THE Chicago, Rock Island & Pacific Railroad Company has an acrobatic brakeman who is fond of amusing himself turning cart-wheels on the top of the cars when the train is running, the crossing of a high bridge being the time when his performances are most frequently displayed. There is a very high bridge crossed by the road at Iowa City, and the idlers of that place have got in the habit of congregating at the bridge when the acrobatic brakeman's train comes along, to witness his feats. We predict that his fondness for turning cart-wheels will eventually bring him into fatally close relation with the car wheels.

DURING a recent conversation with Mr. W. H. Day, Master Car-Builder of the Wilmington & Weldon Railroad, we learned that his company talk of enlarging their shops. The present shops are at Florence, S. C., and they are not large enough to keep the work going for the increasing requirements of business. In addition to effecting extensive repairs, they built four new passenger cars last year, the design followed being similar to the Pennsylvania Central cars. The native woods of the South are freely utilized in the car-building work, and they provide a handsome variety for ornamental purposes, besides being strong and durable for ordinary construction.

THE American Brake Co., of St. Louis, have fitted up a train consisting of a locomotive equipped with the company's engine and tender brake, fifteen freight cars equipped with their automatic freight-car brake, also a caboose and sleeping car, for the purpose of testing these brakes. A careful record will be made of the results, and, in order that the record may be reliable, the train will be provided with such mechanical appliances as will give accurate information as to speed, resistance, breaking force, etc. The tests will be made at the chief railway centers of the country, where they can be witnessed by prominent railway men, and will doubtless attract much attention.

The Northern Pacific Railroad Co. have started to lead other roads in their movement of fast freight trains. They have commenced running freight trains between St. Paul and Portland in 160 hours, which is better freight train time than is made on any other road in the country. The distance is 2,412 miles, so the trains are run through at a maintained average of fifteen miles an hour, making no deductions for stops. This will represent a running time of about twenty miles an hour, which, according to the experiments made on the Lake Shore & Michigan Southern by Professor P. H. Dadley with his dynagraph car, is the most economical speed at which trains can be run with locomotives having 5-foot drivers.

A NEW building is in course of construction on the east side of the New York Central passenger depot in New York, which will add very materially to the present terminal facilities of the road. It is of the same length as the original structure, by 110 feet in width, with an intervening space of 30 feet for freight tracks. In the new building there will be five tracks, which will be used exclusively for incoming passenger trains, while those outward bound will start from the tracks in the old building. The architectural style of the new structure is similar to that of the old one. The front is of brick with cast iron trimmings. The roof is entirely of iron, with a sky-light 30 feet wide running its entire length.

THE employés on our railroads give frequent proof that in performing their duties they are ready to sacrifice their lives as daringly as any soldiers who ever fell with their face to the foe. The latest hero who sacrificed his life calmly on the altar of duty was George Murphy, engineer of an express train on the Philadelphia & Reading road. Near Atlantic City an open switch led the fast-running train into a siding where cars were standing. There was plenty of time to jump after applying the air brake, but Murphy kept at his post, reversing the engine and applying sand. The speed of the train was checked sufficiently when the smash came to prevent serious damage to the passenger cars, but Murphy was killed.

WE were recently informed by a Boston master mechanic of a curious experience with a passenger engineer. While running a fast train one day, he passed a danger signal in broad daylight without stopping and without having any excuse to offer for doing so. He was laid off for three months as punishment for the offense, and then he was put to work again. He ran his trains again without any irregularity for several weeks, but again distinguished himself by running through the yard of Boston against all the signals. Fortunately, no accident happened, but an investigation into the engineer's condition was made, and it was found that he was suffering from softening of the brain and was, in fact, a mental wreck from disease.

A BAD case of train wrecking is reported to have been effected in Russia recently. The fastenings of the rails were removed with the view of ditching a fast mail train, and it was expected that a disastrous wreck would result. The train came along and ran into the trap, but the cars were all equipped with the Westinghouse automatic brake, which prevented the cars from pounding each other, and brought them to rest so promptly that no great damage was done, no person being injured. The official sent to investigate the matter reported that the accident was the work of wreckers, who were actuated by political motives in wishing to destroy the train, and that their object was frustrated by the efficient action of the automatic brakes.

DURING the month of May the Lake Shore & Michigan Southern Railway Company had 541 locomotives for operating 1,340 miles of track. The engines, including those undergoing repairs, made an average mileage of 2,133 miles, and for the engines in actual service, the month's running reached an average of 2,751 miles. The total expense for each mile run was 14.18 cents, divided up into 3.55 cents for repairs, 4.33 cents for fuel, 0.09 cents for lubricating oils, 6.21 cents for engineers', firemens' and wipers' wages, also small stores. Throughout the whole four divisions, the locomotives ran an average of 39.04 miles to the ton of coal, which cost on tenders $1.64. On one division the passenger engines made an average of 46.43 miles to the ton of coal. An average of 28.88 miles was run to the pint of lubricating oil.

American Railway Master Mechanics' Association.

EIGHTEENTH ANNUAL CONVENTION.

The eighteenth annual convention of this Association was held at Willard's Hotel, Washington, D. C., beginning June 16. Owing to the death of the President, Mr. J. H. Flynn, the Vice-President, Mr. J. Davis Barnett, occupied the chair.

On the meeting being called to order, prayer was offered by Rev. Dr. Sunderland. Mr. James B. Edmonds, President of the Board of Commissioners of the District of Columbia, then welcomed the members to Washington in a most felicitous address. He spoke of the wonderful work the members were engaged in, keeping the wheels of railroad progress in motion, and denominated them master magicians who were engaged in revolutionizing the conditions of human existence, and whose contests had not been for dominion over man through fields of blood, but through God-like supremacy of mind over matter.

On the Secretary calling the roll, the following members were found present:

MEMBERS PRESENT.

J. D. Barnett	Grand Trunk.
Chas. Blackwell	Norfolk & Western.
John Black	Cin., Ham. & Dayton.
J. M. Boon	New York, W. Shore & Buffalo.
Geo. E. Boyden	New York & New England.
R. H. Briggs	Ches., Ohio & So. Western.
G. Brownell	Burlington & Lamoille.
H. S. Bryan	Chicago & Iowa.
R. W. Bushnell	Burlington, C. Rapids & Northern.
John Campbell	Lehigh Valley.
N. E. Chapman	Midvale Steel Co.
T. L. Chapman	Chesapeake & Ohio.
Allen Cook	Chicago & Eastern Illinois.
John S. Cook	Georgia Railroad.
H. L. Cooper	New York, Lake Erie & Western.
G. H. Colby	Boston & Albany.
Edward Evans	Cin., Wash. & Baltimore.
H. W. Eddy	Boston & Albany.
W. C. Ennis	New York, Susq. & Western.
Jos. Eckford	N. York, Chicago & St. Louis.
J. M. Foss	Central Vermont.
L. Finley	Hot Springs R. R.
W. A. Foster	Fitchburg R. R.
G. W. Gates	Western of N. C.
Albert Griggs	Providence & Western.
Chas. Graham	Del., Lack. & Western.
J. S. Graham	Lake Shore & Mich. Southern.
G. D. Gilson	Boston, Mass.
I. T. Gordon	Concord R. R.
W. L. Gilmore	Cleve., Col., Cin. & Ind.
M. L. Hinman	Brooks' Locomotive Works.
B. R. Harding	Raleigh & Gaston.
S. A. Hodgman	Wilmington, Del.
J. C. Haggett	Dunkirk, A. Val. & Pitts.
T. J. Hatswell	Flint & Pere Marquette.
Jacob Johann	Springfield, Ill.
J. I. Kinsey	Lehigh Valley.
J. N. Lauder	Old Colony.
H. L. Leach	Boston, Mass.
Wm. Lannon	Washington, D. C.
W. H. Lewis	Del., Lack. & Western.
Jas. Meehan	Cin., New Orleans & Tex. Pac.
J. C. McCune	Sonora R. R.
Jas. McGlenn	Carolina Central.
J. S. McCrum	K. City, Ft. Scott & Gulf.
J. E. Morrill	Chicago, R. Island & Pacific.
L. B. Paxton	Phila. & Reading.
Ira Petrie	Jack. & So. Eastern.
M. M. Pendleton	Seaboard & Roanoke.
P. J. Parrin	Taunton Locomotive Works.
G. W. Prescott	Terre Haute & St. Louis.
J. S. Porter	Ind., Bloom. & Western.
G. B. Ross	New York, Lake Erie & Western.
E. M. Roberts	Ashland Coal & Iron Co.
W. A. Stone	New York & New England.
Geo. W. Stevens	Lake Shore & Mich. So.
H. M. Smith	St. Louis Bridge & Tunnel Co.
H. Strode	Northern Central.
W. H. Stearns	Conn. River.
D. O. Shaver	Pennsylvania R. R.
J. H. Setchel	Brooks Locomotive Works.
Wm. Smith	Boston & Maine.
W. H. Selby	Wabash & St. Louis.
Wm. Swanston	Jeff., Mad. & Ind.
H. W. Sprague	H. K. Porter & Co. Loco. Works.
T. W. Twombly	Chicago, R. Island & Pacific.
W. F. Turreff	Cleve., Col., Cin. & Ind.
W. H. Thomas	Chesapeake & Ohio.
John Thompson	Boston, Mass.
Wm. Woodcock	Phila. & Reading.
C. W. White	Louisville & Nashville.
H. A. Whitney	Intercolonial.

ASSOCIATE MEMBERS.

F. W. Dean	Cambridgeport, Mass.
Angus Sinclair	*National Car-Builder.*
W. A. Smith	*Railway Review.*

NEW MEMBERS.

The following new members joined the Association during the meeting:

John Bean	Connotton Valley.
A. Becket	Baltimore & Ohio.
A. J. Cromwell	Baltimore & Ohio.
M. Lemar Collins	Western & Atlantic.
A. Fenwick	G. Bay, Winona & St. Peters.
A. G. Galloway	Cleveland & Marietta.
W. Harrison	Baltimore & Ohio.
W. L. Holman	Phila. & Erie.
W. E. Lockwood	Philadelphia.
Basil Manly	Atlantic & N. Carolina.
Thos. Mellen	N. Y. City & Northern.
C. W. Mills	Rochester & Pittsburgh.
A. J. Pitkin	Schenectady Locomotive Works.
O. Stewart	Fitchburg R. R.
O. H. Thomas	Chesapeake & Ohio.
W. J. Robertson	C. V. & St. A.
John Torrence	Evansville & Terre Haute.
I. M. Whitlock	New Haven & Derby.
R. Williams	Texas & St. Louis.

The following new associate members were admitted into the association: R. Grimshaw, John A. Coleman.

The following were elected honorary members: Jas. W. Ledgley, A. J. Philbrick, Wilson Eddy, H. A. Towne and S. M. Cummings.

PRESIDENT'S ADDRESS.

Vice-President Barnett, in his opening address, alluded feelingly to the loss they had sustained since last meeting in the death of their President, Mr. J. H. Flynn, and paid him a high tribute of respect, expatiating on his admirable qualities as a man, his genial, attractive ways as a member of the Association, and his high ability as a progressive master mechanic. Death had also called two more of their members since last meeting, Messrs. J. A. Durgin and James Cook having passed away. In speaking of the valuable work which the Association had performed since its inception, the Vice-President dwelt at considerable length on the advantages derived from the services of the zealous and tireless Secretary Mr. J. H. Setchel. The prosperity, and even life of such an association, often depended on the management by the executive officers, and Mr. Setchel, during the fifteen years he had been Secretary, had helped in a wonderful manner to inspire his associates with energy and zeal in advancing the interests of the organization. This association, the speaker said, was the pioneer of its kind, but there were now numerous local clubs and associations of a similar character, that are doing good to their members and to railroad interests. These clubs will also prove beneficial to this Association, by preparing the members to take an active part in the proceedings. Mutual interchange of opinion and experience is of great value, and its importance is becoming recognized more and more. The important improvements effected on the locomotive in recent years bear testimony that the members have not been inactive. The locomotive, he said, compared very favorably with other engines, for the consumption of coal per horse-power per hour is now nearer two than three pounds, the excellence of the performance making many engineers doubt the correctness of the experiments. In bringing about the improvements, the power of the engine had been increased without increasing the dead weight, which does not now exceed from 60 to 100 pounds per indicated horse-power. Improvement in the proportioning of parts, better selection of material, increase of wearing surface and better lubrication, had greatly reduced the need for repairs, and the average rate of repairs for road locomotives has now become so low as to surprise other sections of the engineering world. He believed that the expenses of operating locomotives might be yet farther reduced by improving the appliances relating to and the methods of combustion, while greater durability might be given to wearing surfaces by a better selection of metals. The manufacturers can not be expected to make great improvements until they are informed of what is wanted. He thought the varied means of moving trains being tried by tramways, ought to receive the attention of master mechanics, for the fireless locomotives and different other motors were interesting appliances from which important points might be obtained. Electricity for lighting and signals was advancing into use so rapidly, that its manipulation would soon form a part of their work. He spoke of the technical schools that have been established in connection with so many railroads, and congratulated the rising generation of mechanics on the excellent facilities they enjoy for acquiring technical education. The skill and knowledge acquired through these institutions would redound to the benefit of railroad companies encouraging them.

OFFICIAL ACTION ON THE DEATH OF PRESIDENT FLYNN.

Mr. N. E. Chapman, referring to the death of the late president, Mr. John H. Flynn, suggested that the chair appoint a committee to present suitable resolutions. The chair nominated for this committee Messrs. N. E. Chapman, J. N. Lauder and Angus Sinclair, and ordered a recess of half an hour. When the meeting was again called to order,

Mr. Angus Sinclair, on behalf of the committee, read the following resolutions, which were ordered to be entered in the proceedings:

WHEREAS, in following the inscrutable decrees, the Almighty has, since we last met, removed by death our highly esteemed president, John H. Flynn; it is therefore

Resolved, That we, the American Railway Master Mechanics' Association, desire to record our sense of the irreparable loss we have sustained;

Resolved, That we express our condolence with the family and friends of our deceased president in the severe bereavement they have sustained, and that a committee be appointed to prepare a biographical account of the life of our late president, to be incorporated in the records of this association;

Resolved, That a copy of these resolutions be transmitted to the family of the deceased member.

Messrs. N. E. Chapman, R. H. Briggs, H. N. Sprague, J. N. Lauder and Wm. Woodcock eulogized Mr. Flynn in eloquent and pathetic language.

SECRETARY'S AND TREASURER'S REPORTS.

Owing to the absence of the Treasurer, Mr. Richards, in Europe, Secretary Setchel made a joint report. The membership was: Regular members, 220; associates, 13; honorary, 3; total, 236. Since last report was made 17 members had joined; 6 had resigned, and 12 had been dropped as delinquent.

Regarding financial matters, the balance in treasury at last report was \$367.96; received during the last year, \$1,811.60; total, \$2,179 56; expenditures, \$1,871.30; balance, \$308.26. The Boston fund now represents a total value of \$5,392.93, all of which is invested except \$98.93.

The report was received, and Messrs. N. E. Chapman, J. M. Boon and W. Turreff were appointed an auditing committee, and Messrs. Wm. Smith, C. Graham and J. Campbell were appointed on assessments for next year.

Mr. Setchel read the following:

REPORT ON THE PRINTING OF STANDARDS.

To the American Master Mechanics' Association:

GENTLEMEN—At the seventeenth annual meeting Mr. J. N. Lauder offered the following resolution, which upon motion was adopted:

Resolved, That the standards adopted up to the present time by the Master Mechanics' Association be printed in our annual report.

The Master Mechanics' Association as a body have not been as prolific in adopting standards as some of our kindred societies; and the number to report will not be as great as its age might indicate.

We believe that the opinion is held by the majority of the members that much more good is accomplished by an intelligent discussion of questions by the many than the passage of a resolution emanating from the brain of a single individual, which is often adopted against the will of a silent majority. Many seemingly knotty questions have been made clear by the discussions had at the conventions, and a member has been able to go home and take a step in advance of any standard that could be adopted at the time.

Many things that seem difficult to decide are only so because the subject is not fully understood.

Discussion brings out the dark points so that we are able to advance, and to adopt a certain rule as a standard often means to stop advancing.

There are, however, many parts of the machinery in the construction of railway plants where uniformity can and should be secured by the adoption of standards, and to these I think it will be found the Master Mechanics' Association has given due attention.

Standard Nuts.—In the third annual report the convention on standard nuts recommended the adoption of the United States standard, but in receiving the report the association did not adopt the committee's recommendation, as it was no doubt the intention to do, and Mr. Chapman, who was chairman, so stated at the fifth annual meeting. At this meeting, on a motion of Mr. Hayes, the same committee was appointed to confer with the bolt and nut manufacturers, and at the sixth annual meeting made the following report:

"Your committee appointed at the last annual meeting to confer with a committee appointed by the association of bolt and nut manufacturers of the United States upon the subject of uniform standard sizes of nuts, would recommend the adoption of the sizes of nuts as adopted by the manufacturers' association at their meeting, December 11, 1872."

Standard Wheel Centers and Tires.—At the third annual meeting this subject was brought up and excited a large amount of discussion, resulting in the appointment of a committee to report the next year, but at the fourth annual meeting the President announced that there would be no report from this committee and the subject has never since been taken up.

Switching Engine Mileage.—At the fifth annual convention a committee previously appointed on the subject of computing mileage of switching engines, reported in favor of allowing six miles per hour for switching engines and six per cent. to train mileage of freight for switching, and no extra mileage for through freight and passenger train, which was adopted.

Standard Axles.—At the seventh annual meeting a committee on the subject of standard axles recommended the adoption of an axle for tenders as follows:

Length over all, 6 feet 11¼ inches; journal, 3¾ × 7 inches; wheel seat, 4⅞ inches diameter by 8 inches long; diameter in center 4 inches; collars, 4¾ inches by ⅝ of an inch thick. After considerable discussion, action was postponed and subject was referred back to the committee. At the eighth annual meeting the committee on standard axles offered the following resolution:

Resolved, That this association concurs with the Master Car-Builders' Association, recommending the adoption of the standard for car and tender axles which that association has proposed, when said axles are made of iron.

After considerable discussion the resolution was rejected, and was not again brought up until the twelfth annual meeting, when on motion of Mr. Johann the Master Car-Builders' standard was adopted.

Standard Journal-Bearing, Journal-Box and Pedestal.—At the fourteenth annual convention, the following resolution was presented and adopted:

Resolved, That the drawings of the car journal-bearing, journal-box and pedestal, of which copies are submitted herewith, be declared to represent the standard form and proportion for these parts, and that the same be recommended by this association for general use on engines and cars.

Standard Sheet Metal Gauge.—At the fifteenth meeting of the association Brown & Sharpe's micrometer gauge was adopted as the standard.

Standard Limit Gauge.—At the seventeenth annual convention the Pratt & Whitney standard limit gauge for round iron was recommended and adopted.

To recapitulate, the following are the standards adopted by the association:

Nuts.—United States standards.

Screw Threads.—United States standard.

Switching Engine Mileage.—Switching engines six miles per hour. Local freight engine, 6 per cent. added to train mileage.

Standard Axles, Bearings and Boxes.—Master Car-Builders' standard.

Standard Sheet-Metal Gauge.—Brown & Sharpe's.

Standard Limit Gauge for Round Iron.—Pratt & Whitney's.

Very respectfully, J. H. SETCHEL, Secretary.

The report was accepted.

PROPER HEIGHT FOR DRIVER FLANGES.

The hour having arrived which is usually devoted to the discussion of short questions, Mr Sprague asked what was the proper height for the flanges of driver tires. They were usually rolled 1¼ inch, but no one used them of that depth, and he failed to see the use of rolling them so deep when they had to be turned down. The Master Car-Builders had adopted a flange 1⅛ inch deep, and recommended 1 1/16 inch for wheels, and he wanted to know if any one used more than 1⅛ inch.

Mr. McCrum thought there was no use in rolling flanges so deep.

Mr. Black had been using flanges 1 inch deep and found that sufficient.

Mr. Hatswell was using flanges 15/16 deep, and considered that sufficient.

Mr. Lauder thought this question was worthy of action on the part of the association. Some use flanges 1 inch or less, and when they are rolled 1¼ inches deep, the railroad companies have to pay for metal that is not used. This causes a leak that ought to be stopped. He thought 1 inch was enough, and held that the tires should be rolled so as to need no machine work. The subject of wheel centers had been before them many years ago, and it was now time to settle it by adopting standards which would enable makers of tires to carry a large stock on hand at all times. He suggested that the subject be given to a committee, which could also decide about the proper height for flanges.

Mr. Johann concurred with Mr. Lauder's views. He thought the centers and tires should be made to uniform sizes, and believed the adoption of standard sizes would help the members as much as manufacturers. In his own practice he had used uniform sizes for wheel centers, and he was sorry the association had not taken decisive action on the subject years ago.

Mr. Black saw no reason why the Association should not settle this question to-day.

Mr. Lauder thought the matter was more difficult to settle than Mr. Black supposed. There was now such a diversity of sizes that a report must be compiled to find out the most acceptable dimensions

Mr. Sprague moved that the committee on subjects be instructed to include one on uniform wheel centers and height, diameter and shape of flanges.

Mr. Hatswell thought the width and thickness of tire should not be part of the standard.

Mr. Johann wanted all particulars of tires included. The effect of such a decision would be to make tire workers carry the requisite stock of tires instead of railroad companies. They should ask all concerned their opinion as to the best dimensions, and get manufacturers and locomotive builders to send in drawings. They would do well if they settled the matter in two years.

Mr. Sprague added an amendment that the committee include the thickness of tire also.

Mr. Lauder wanted information as to the advisability of using 4-inch tires. He did not feel sure about the texture of very thick tires being so good as that of thinner ones.

Mr. Blackwell thought the committee should also report on the shape of tread.

Mr. Swanston believed the thick tire was the most economical.

Mr. Setchel remembered a similar discussion thirteen years ago, in which several of the same speakers participated. All wanted a report then, but at the following meeting he was surprised to find no report was made. It was important that tires should be obtainable at a moment's notice. There are certain nominal sizes for 5-feet and 5½-feet wheels. If the average sizes were known with exactness, it would be easier reaching an agreement. If this committee could make standards, it would save the roads from carrying a large stock of tires, and if they did not adopt standards he thought the makers had a right to make a higher charge for special sizes. He thought 3 inches a good standard thickness for tires. If only 2 inches were used, one-half of the tire would be thrown away, as they could not be run thinner than 1 inch. Some engines had tires extending from ¼ to ¾ inch beyond the wheel center. Any width over $\frac{5}{16}$ inch he considered worse than useless, as it made a wide flange on each side as the tire wore.

Mr. Lauder moved to amend the motion so that the report of the committee should include every particular of the shape and size of tires. This motion was passed.

IRON FIRE-BOXES.

Mr. Swanston understood that several members had gone back to iron instead of steel for side sheets, and wanted to know particulars.

The Secretary explained that the subject would come up for discussion after the report on boilers was read.

LOCOMOTIVE TRACTION INCREASERS.

Mr. Briggs asked what was the best method of increasing the traction of eight-wheel locomotives.

Mr. Shaver wanted to include in the report of the committee on tires a standard wheel gauge, but no action was taken in the matter.

Mr. Setchel did not know what was the best method, but they had used on the Ohio & Mississippi road, on an 18 by 24 passenger engine, and on a ten-wheel 19 by 24 freight engine, a device for throwing the weight of the tender on to the engine wheels. It puts from 3,000 to 5,000 pounds per wheel extra weight. An engine that was almost continually slipping would, with this device applied, go along without sand. The increaser takes the place of sand but it would be too hard on the springs to leave it on all the time. It might be dangerous to weak bridges, but the engineer could be told not to use the device at such places.

Mr. Whitney asked if it would not be dangerously hard on the rail.

Mr. Setchel replied that it must be applied gradually, but of course it gave a heavier blow. The wear of the rail was less than when sand was used.

Mr. Lauder said that sanding the rails made a train draw harder, especially on curves. The traction increaser might be used beneficially to avoid sanding.

Mr Swanston put a traction increaser on an 18 × 22 engine, which, on a 60 grade, took 19 cars. They tried it with 24 cars when the traction increaser was in use, but she slipped and took only 22 cars over. They then tried 24 cars, using sand to prevent slipping; got stalled but succeeded in taking up 23 cars. He did not think the device of any use.

Mr. Angus Sinclair had known of a great many traction increasers being tried, but all had failed sooner or later. He had recently learned the particulars of a test made with a traction increaser on the Burlington, Cedar Rapids & Northern road. They put a traction increaser on an eight-wheel engine, and tried her with a heavy train on a hill near Cedar Rapids, and it was found that the engine would pull as much without the increaser as she did with it in use.

Mr. Briggs could not see how engines could do as much work with 3,000 to 10,000 pounds less on their drivers. The extra weight must be a benefit. He wanted to know what were the varieties of the machines. Had they been practically tested?

Mr. Lauder said they had just the explanation of a case where they were of no use. That was his experience with them exactly.

Mr. Setchel said, if an engine slipped with 10,000 pounds per wheel, and this device provided the means of adding 5,000 pounds more, which prevented slipping, its advantage was beyond question. Some builders are resorting to putting castings between the frames and similar methods to obtain adhesion. He thought traction increasers that made part of the tender's weight available for adhesion the better way.

Mr. Blackwell thought the necessity for increase of weight depended on the size of the cylinders. If the cylinders were so small that they would not slip, the wheel traction increasers could not increase the power of the engine.

Mr. Sinclair thought the association should go on record as favoring better methods to obtain adhesion than traction increasers or weights hung on the engines. Lack of adhesion could be cured by heavier boilers and a better distribution of weight. Slipping is generally due to malconstruction. This association ought to favor the proper designing of locomotives, so that the cylinder power should not be too great for the weight available for adhesion. Engines generally slipped because the cylinders were too large for the boilers.

Mr. Johann agreed with Mr Sinclair as to the necessity for designing locomotives properly, but he did not agree with Mr. Lauder that traction increasers were of no benefit. Some time ago one of his engineers could haul three more cars over a certain grade than any of the others. They watched him, and found that before going upon the grade he raised the rear-end of his engine and got the greater part of the weight upon the forward drivers. This prevented the tendency to slip. He favored larger boilers to obtain the desired weight.

Mr. Briggs said what might be all right on properly designed engines would not help them out on old, slippery engines that they had to pull trains with. He thought traction increasers would help engines of this character.

Mr. Sprague thought the weight should not be put on the tires except when needed for work, even in the case of new engines.

Mr. Setchel said Mr. Sinclair forgot that every pound of dead weight is dead loss, whether carried or hauled. If we could utilize for traction all the weight of coal and water, it would be better. When cylinders were bored out, increasing the tractive power, an engine often got so there was no holding the wheels down. Traction increasers were needed for such engines.

Mr. Hatswell thought no benefit was got from the weight of the tank being thrown on the engine. He had tried the Locomotive Improvement Company's device, and found it no advantage. He had found weights and cast-iron cabs more benefit.

Mr. McCrum had a 17 × 24 engine with 5-feet wheels and 48,000 pounds on drivers, and it was made two cars better by the traction increaser. He intended putting it on other engines of the same class, but lighter. He wanted to know why tender weight was not as effective as any other.

Mr. Hatswell said he could not get the same results. Engines slipped as badly with the traction increaser as without it.

Discussion closed.

The Secretary then read the

REPORT OF THE BOILER COMMITTEE.

Mr. President and Gentlemen:

The slight result that followed the issue of circulars the last few years, is the reason no circular was issued this year by your committee on boilers; its working members believing that a résumé of the past work, rating the points from which progress had been made, would probably prove interesting and elicit free general discussion.

Steel Plate.—Steel was reluctantly used in 1869 (see page 10 of report for that year), but 200 boilers of steel are reported in 1875 (page 15), and it is recommended in that year (page 16), exclusively recommended in 1877 (page 52), and the committee is unanimous in 1878 (page 86). In 1870 an opinion from a French engineer was quoted (page 18), saying steel plate for boiler use should be capable of hardening; presumably he was using the metal in barrel plates and, to reduce their thickness and weight, required a metal of high tension which he would secure in a steel that tempered by immersion; but in 1871 (page 10) the complaint was that it was manufactured too hard, and in 1875 (page 16) steel that will not harden is recommended more especially for fire-box service. The steel we now easily procure and should use for both sheet and furnace, has but a small percentage of carbon, say from 15 to 20 per cent., and, therefore, is fairly free from silicon, phosphorus, etc., will not harden, is mild and ductile, working under the hammer, even when cold, most freely; has a breaking resistance of from 62,000 to 65,000 pounds per square inch of section, with an extension of 24 to 25 per cent. and length of 10 inches. A good shop test—in addition to bending over at a point in test piece where it has been punched either cold or after it has been heated and dipped in water—is to take a narrow strip through which a hole one-fifth its width is punched and then enlarge the hole with a drift and flagging hammer to fully three times its original punched diameter without splitting the strip.

It may be said that there is now no practical limit to the size that steel sheets of desirable quality and thickness can be procured. The Canadian Pacific Railway are making the straight portion of wagon top boilers in one plate, and receive sheets 14 ft. 3 in. × 8 ft. $\frac{7}{16}$ in., and last year at Erie, Pa., ⅝-inch plates 16 ft. long were bent cold in rolls to a curve of 30-inch radius, so that two sheets made one boiler 16 ft. long and 60 in. diameter, with but two longitudinal joints in barrel; and Mr. Webb has rolled from ingot and used $\frac{7}{16}$-inch steel plate 11 ft. 3 in. wide × 12 ft. 9 in. long in one barrel ring. This practice is in line with the strong recommendation of the committee in 1871 (page 14), but as they point out, it requires special rolls to be built for bending the plate. Mr. G. S. Strong says he is now constructing a 56-inch straight boiler for 175 pounds pressure, with all longitudinal seams welded. Welded seams, when iron plate and coke fire were used, give at least but an ultimate tension of 14 tons and 6½ per cent. extension for 22-ton iron; therefore, it is not a matter of surprise that such a form of joint was seldom used, but now Mr. S. Fox, using 22-ton mild steel and common gas flame for heating the scarf, secures a weld having an ultimate tension of 21 tons and an elongation of 8½ per cent. in a 10-inch length, that is an increase of 50 per cent. in strength and 30 per cent. in ductility; although it should be noted that this excellent result is but one-third the ductility of the unwelded steel plate. Some careful experiments show that very mild steel, after annealing, loses somewhat in resistance to ultimate tension and in ultimate percentage of extension, or, in other words, annealing does not necessarily improve the natural plate. Nevertheless, if holes are punched in plate, or plate has been flanged or set when warm, mild steel must be annealed, the annealing furnace temperature not being carried too high—a blood of cherry red is quite sufficient—the time in furnace not prolonged beyond the point that will secure thorough and equal temperature, and the cooling not too much hurried by contact with damp earth, or a current of wind at low temperature. Neither should there be any attempt to "soften off" by cooling in a bed of sawdust or ashes.

If the flanging, setting or any other distortion, such as bending in the rolls, can be done cold, there is no necessity for annealing either plates or bars, but all such setting is preferably done under the steady pressure of hydraulic tools.

Drilling vs. Punching.—In 1872 (page 19) preference is given to drilling rivet holes rather than to punching, but with the leather-like ductile metal now supplied and within the limits of ordinary thickness of boiler plate used in locomotives, the extra expense of drilling is not justified, and the excess diameter of hole in die over punch need not exceed $\frac{1}{32}$ inch for plates one-half inch thick and under.

Rivets.—Steel rivets are not reported as being in use in 1871 (page 12), neither are they used to any extent at this date, yet in view of all the conditions of the case, and until the obscure matter of galvanic action and its influence on corrosion, pitting and furrowing is more clearly understood, it would be wiser to use steel rivets with steel plates, thus bringing metals together that are quite similar in nature and electric affinities.

The proportions for riveted joints that suited iron plates, have apparently in many instances been transferred to steel plates of similar thickness without any serious question as to their similarity, whereas the weight of the evidence (more particularly the elaborate experiments of Professor A. B. W. Kennedy for the Institute of Mechanical Engineers) show that to attain a joint of maximum strength, a larger proportional rivet area to resist shearing is required with steel rivets and steel plates than with iron, the larger diameter, however, permitting a wider pitch. Thus, for single riveted lap joints, the pitch found best is 2.25 diameters of rivet hole, and diameter of hole 2.25 thickness of a single plate, the diameter of the rivet being about $\frac{1}{32}$ inch less than the hole. If this proportion should not divide out well, the pitch should be increased to 2.3 or 2.4 diameters. This, for a ⅝-inch plate, will give a ⅞-inch hole and 2-inch pitch, a wide departure from average practice in iron plates or in steel plates with iron rivets; and the reason for this altered proportion is found (1st) in the fact that in a material so ductile as modern boiler steel the joint is helped materially by the great comparative excess of strength in the plate after holes are cut through; and (2d) that while the plate is comparatively so much stronger than before, there is no corresponding increase in the shearing resistance of the rivets over the strength commonly found in iron rivets.

The average practice in ⅝-inch iron varies from ⅝-inch rivets with 1¾-inch pitch and $\frac{11}{16}$-inch rivets with 1⅞-inch pitch to ¾-inch rivets with 2-inch pitch as a maximum. A 2-inch pitch is rarely used for any diameter of rivet, and we know of no practice in ⅝-inch plate using rivets of larger diameter than ¾-inch, whereas ⅞-inch would make a stronger and better balanced joint for very mild steel, and will secure a single riveted joint having 60 per cent. of the strength of the unperforated plate. For double riveted joints (either lap or butt), using a diameter of rivet that is 2¼ times the thickness of the single plate, the pitch should be approximately 4 times the diameter for the thickness of plate commonly used in locomotive practice, the pitch being proportionately narrowed as the tenacity of the plate is higher than 30 (long) tons per square inch.

The position of the second row of rivets should be such that the net diagonal area of plate or area along zigzag line should not be less than 30 per cent. in excess of the net area across the joint, and 35 per cent. is better than 30 per cent.

The general tendency of present practice (a survival from other days and other conditions) is to put too many small rivets in a double joint, as if afraid the joint would leak, but pitches of 3 inches in ⅝-inch plate are tight at 120 pounds pressure, and in $\frac{9}{16}$-inch plates pitches of 4.14 inches are tight at 160 pounds.

Power Riveting.—Machine riveting by a single squeeze was not approved of in 1871 (p. 70), but the steam piston riveter giving several strokes was. This is now practically superseded by the hydraulic piston, having the merits of the single close squeeze, and the adjustability of the steam piston, producing work of unequaled solidity, and dispensing with the necessity for calking, as boilers are now turned out tight under the test pressure of 160 pounds. A large amount of boiler patching, and almost the whole of the work on new tender tanks in position, can be done by the portable hydraulic tools of W. R. A. Tweddell (specimens of hydraulic riveted joints exhibited.)

A noteworthy point about hydraulic riveting is that even in those cases where it does not increase the absulute strength of the joint it makes it so much *stiffer* that visible slip does not commence until the pressure is from 100 to 125 per cent. higher than when slip commences in hand-made joints. This explains why hydraulic-riveted boilers do so little weeping under high test pressure.

Calking.—One source of danger in boiler manufacture is excessive joint calking (both inside and out) with sharp-nosed tool so close to inner edge of the plate as to indent, and in many cases actually cut through the skin or the lower plate. The old style of calking that put a positive strain upon the rivets commencing distortion and putting excessive stress upon rivets (already in high tension) before boiler commenced work is, we hope, fast becoming a thing of the past. With a proper proportion of diameter and pitch of rivet to suit steel, all that is required is the use of a light fuller (used by Mr. Webb, London & Northwestern Railway) which does not force the joint. The use of a round-nosed tool (of which some good work was shown at the Centennial Exhibition at Philadelphia) is not as good, but it is infinitely better than the calking tool, which has often started cracks that worked inward or resulted in furrowing.

There is but little need for calking if means are taken to secure a clean metal-to-metal face at the joint. When the plates are put together in ordinary course of manufacture, a portion of the mill scale (black or magnetic oxide) has been shaken off, but part is left on, and this is reduced to powder or shaken loose in the course of riveting and left between the plates, thus offering a tempting opening for the steam to work through, and is really the cause of the heavy caulking that puts so unnecessary a pressure on both plate and rivet.

A clean metallic joint can be secured by passing over the two surfaces waste wet with a weak solution of sal-almoniac and hot water, an operation certainly cheap enough both as to materials and labor required. This practice has been carried out with success for years on the London & Northwestern Railway.

The result of such practice is that the riveted joint can be allowed a wider margin beyond outer edge of rivet, the rivets themselves to have a larger diameter which mild steel absolutely requires, and the rivets to be pitched correspondingly farther apart, as the pitch has often heretofore been controlled more by the resistance required to meet the heavy use of the old calking tool than settled by an investigation into the best proportion to secure the utmost strength for given thickness of the good material that is now almost exclusively used in locomotive boilers.

Crown Stays.—Crown stays should be "double plated transverse girders 1 inch clear of sheet," said the committee in 1869 (page 10). In 1871, however, the troubles incident to this class of stays are fully recognized (page 15), and the recommendations are for bars to be fewer and stronger, entirely supported from outer shell, that the clearance underside be increased, and that washers and distance ferrules be dispensed with.

If this class of stays is to be used, nothing better is shown than the solid steel crown bar castings (1883, page 80), but your committee cannot but continue to emphasize their recommendation to the use of rods screwed through both crowns with their ends riveted over, a plan so old as to have been used in Stephenson's "Rocket" in 1829, and for which a patent was granted in 1848. In 1871 (page 16) this system is said to be weak, but your committee have been looking for a case of failure in this class of staying without success, even in boilers that have the two crown sheets so far from being parallel that the stay is a long way from being perpendicular to either sheet. In fact, an angle that permits of but one perfect and complete screwed thread for a continuous circumference, will—if the riveting over be carefully done—prove sufficient to last out the inner fire-box. Bolts with their heads on the inside of the inside fire-box may be safer (see 1880, pages 61, 62, 68, and 1881, page 64), but we doubt the necessity for this excess of strength; and so made, it is more difficult to use the twist drill socket for screwing the stays into plate, as this tool must then be used from the inside of fire-box instead of from the outside.

Mr. Urquehart, L. S., of the G. & T. R., Russia, who is burning petroleum refuse (black oil) with such great success in more than 100 locomotives, says that as one of the results of the high temperature attained in his fire-boxes, many nuts on the stay bolts of roof dropped off, after which he made heads on the lower ends of these roof stays; but he goes on to say that the best arrangement is Belpaire's, where the stay bolt is screwed into both plates and riveted over, thus allowing a free circulation of water over the hottest part. It is to be noticed that many years ago nuts were used on the ends of the screwed stays of fire-boxes burning anthracite, but they are now superseded by riveted heads, and the experiments carried out by the United States Navy in 1879 (see Secretary's report) prove that even if snapheaded or button-set they are quite strong enough for their work. The curving and sloping backward of crown sheet, though not approved of in 1871 (page 16), still recommends itself by offering additional facilities in washing off the sheet.

Flues.—Steel flues were but slightly used in 1870 (page 105) and their use at present is not common. They are thin, give a lengthened service, and in the hands of good workmen are (with borax as flux) readily pieced and rewelded to iron ends. Difficulty in rewelding was the chief defect mentioned to their discredit in 1873 (page 43). The statements of Mr. Robison and Mr. Eddy in 1873 (pages 43–4) that brass flues transmitted heat more freely to the extent of justifying—as economical—the use of the more expensive metal, remains unproven to date, and after much experimenting the almost uniform practice of this continent in the use of iron and steel flues contradicts it.

The securing of flues is now an almost uniform practice, viz., parallel, expanding with roller expander and beading the ends over, the fire-box end being encircled by a ferrule $\frac{1}{16}$ or less thick of soft iron or copper, preferably, brazed to the end of the flue; but the distance flues should be spaced apart varies widely, the best evidence going to show economy in the wider spacing up of ⅜-inch water wat, and Mr. Fairies in 1875 (page 59) and Mr. Adams, on the North London Railway, make a good show for 1-inch spaces.

Heating Surface.—Mr. Towne in 1872 (page 64) said (and it was not disputed) that the flues were acknowledged the most effectual heating surface of the boiler. This view is not held by those who, going to the opposite extreme, say with the gauge commissioners that every square foot of fire-box is capable of evaporating two cubic feet of water per hour, experiment having shown that an excellent evaporation for the whole surface (fire-box and tubes combined) per square foot, is one-eighth of a cubic foot per hour, or for 1,000 feet of surface 125 cubic feet = 940 gallons (U. S.). The most common assumption is that the relative values of the flue and fire-box surfaces are as one to three, but Mr. Langridge, in a paper before the "Institute of Civil Engineers," analyzed the actual work of 19 locomotives, from which he found the hourly evaporation from the fire-box surface was as 11.7 to 1; the total average tube evaporation was 0.1365x11.7 = 1.597, or, in other words, with common sizes under ordinary work and with ordinary blast pressure, the fire-box evaporated one-fifth and the tubes four-fifths of the water; consumption of fuel per square foot of grate varying from 38 to 157 pounds, the average being 83 pounds. One of his conclusions was that a large increase of heating surface in proportion to the fuel burned only slightly increases the economical effect. In fact, within the limits of common practice in locomotives, the economic effect is in proportion to about the fourth root of the heating surface. For instance, an increase in heating surface from 915 feet ($\sqrt[4]{\ }$ = 5.5) to 1,296 feet ($\sqrt[4]{\ }$ = 6.0), or of 381 feet, would only give an increased economy of 1-11 or 9 per cent. for the same consumption of fuel. The case, of course, would be different if both engines were being forced heavily, or a greater amount of coal being burned per foot of grate; then the greater absorbing surface would give a higher relative economy.

Blast Pressure.—Mr. O. Busse analyzed some experiments made on the Northern Railway, of France, with an old locomotive boiler having 76½ square feet of surface in fire-box and 717½ in 125 tubes 12 feet long, 1 4-5 in. diameter. The tubes were cut off by bulkheads into four sections of about three feet long, and having nearly 180 square feet of surface. The evaporation was as per table; the blast pipe in smoke-box being supplied from a second boiler One noticeable fact is that the vacuum in smoke-box, measured in inches of water, is increased 400 per cent. without increasing the total evaporation of water 100 per cent. The greater consumption of fuel and the greater speed of smoke due to the highest vacuum improves the evaporative efficiency of the tubes at the outer end 200 per cent., but at best their efficiency is not high, the last 3-foot length having but from one-fifth to one-sixth the evaporative value of the first length.

TABLE NO. 1.

TOTAL EVAPORATION IN POUNDS OF WATER PER HOUR.

Vacuum in smoke-box, measured in inches of water.	Sections in barrel, commencing at fire-box end.				Totals.		
	No. 1.	No. 2.	No. 3.	No. 4.	Tubes.	Fire-box.	Grand total.
.78	57	26	14	8	107	252	360
1.56	82	44	23	15	165	300	465
2.34	118	48	38	25	230	410	641
3.12	105	55	34	25	220	461	681
3.90	149	68	46	30	294	417	712

Putting this statement into the form of percentages of total evaporation (and, as before, ignoring decimal points), we have :

Vacuum in inches of water.	1st. Per cent.	2d. Per cent.	3d. Per cent.	4th. Per cent.	Total of tubes, per cent.	Fire-box, per cent.	Grand total, per cent.
.78	15	7	3	2	30	70	100
1.56	17	9	4	3	35	64	100
2.34	18	7	6	3	36	64	100
3.12	15	8	5	3	32	67	100
3.90	21	9	6	4	41	58	100

The pounds of water evaporated per square foot of heating surface per hour were :

Vacuum in inches of water.	In fire-box.	No. 1.	No. 2.	No. 3.	No. 4.
.78	3.30	.32	.14	.08	.05
1.56	3.92	.45	.24	.12	.08
2.34	5.36	.65	.26	.21	.14
3.12	6.02	.58	.30	.19	.14
3.90	5.45	.83	.38	.25	.16

These comparatively small quantities should be compared with the 18 pounds of water per square foot of surface (tubes and fire-box) evaporated in torpedo boilers with 6 inches of water pressure in stake hole.

It is quite possible that testing the evaporation of independent lengths of the boiler by the use of bulkheads gives a misleading result, as the partitions seriously interfere with the circulation ; circulation being a far more important factor in the transmission of heat than either the nature or thickness of the metal through which heat is transmitted.

With Mr. Busse's figures should be compared the government experiments carried out with Mr. Thorneycraft's torpedo boat boilers of locomotive type having air pressure in stake hole. These boilers have 620 square feet of heating surface, of which 56 feet are in fire-box. Grate surface 18.4 feet, barrel 53 inches diameter. Tubes 205 of 1¾-inches diameter and 6 feet long.

TABLE NO. 2.

Air pressure in stake hole in inches of water	2	3	4	6
Air pressure in ash pit in inches of water.	1.47	2.29	3.26	5.25
Air pressure in furnace in inches of water	1.35	1.87	3 0	4.33
Temperature of feed water, Fahr	53.5°	57.°	54.°	56.°
Temperature in furnace, Fahr	1.037°	1.192°	1.260°	1.444°
Steam pressure above atmosphere, lbs	117	117	115	115
Coal consumed per hour, lbs	925	1,177	1,472	1,815
Coal consumed per sq. ft. of grate, lbs.	49	62	78	96
Water evaporated per hour, total lbs	6,530	7,770	9,320	10,840
Water evaporated per pound of coal, lbs.	7.06	6.6	6.33	5.97
Evaporation per pound of coal reduced to equivalent at 212° Fahr. from 100	7.61	7.08	6.81	6.41
Evaporation per hour per sq. ft. of heating surface	1.08	12.9	15.5	18.0
Duration of experiment in hours and minutes	H. M. 2.0	H. M. 2.7	H. M. 1.39	H. M. 1.27

Coal used, Nixon's Navigation, ashes 9 per cent.

The results would have been more interesting had lower pressure than 2 inches of water been used, as even at half engine power these boilers are overworked, but the influence of pressure on evaporation, combustion and temperature is clear, and the experiments showed that tubes absorb 7-10 and fire and grate 1-10 of initial pressure. The pressure in chimney was about equal to the pressure of atmosphere.

Additional experiments were made to see if the ordinary mode of combustion with steam blast in chimney approximated in efficiency to pressure in stake hole, with the result of showing that steam jet was very wasteful, usually only increasing consumption on grate 40 to 50 per cent. over natural draft, with an increase of efficient power not exceeding 15 per cent.

Turning fan air-blast of 12 inches pressure and more into chimneys and using locomotive nozzles and split-rings from 2 to 5 inches in diameter, the result was poor, the best show being made with a 3½-inch nozzle, but even that was not one-half of what was obtained with 2-inch pressure in stake hole. This result accords with Mr. Langridge's statement that the blast-pipe considered as a motive power is very wasteful, as but from 1-11 to 1-12 of the power escaping is utilized in drawing air through the tube.

It should be noted (see Table 2) that an increase of blast pressure from 2 to 6 inches, or 200 per cent., did not increase the consumption of coal per square foot of grate quite 100 per cent., and the value of the fuel is reduced 15 per cent.

Hollow Stays.—The difficulties in the manufacture of hollow stays and the unvarying supply of air admitted, although the supply should be adjustable to varying demands of the fuel, have not encouraged their use (see 1872, pages 19, 61, 62; 1877, pages 117, 129, 130; 1878, page 16; 1879, page 80), and a fire hole deflector with adjustable door or diaphragm still proves the better plan for admitting the air requisite above the fuel.

Scale.—After continuous reports of non-success with chemical compounds to remove or prevent formation of scale, the recommendations of former committees (see 1873, page 18, and 1874, page 42) are narrowed down to the use of pure water and providing open surface storage reservoirs to secure it, and washing boilers out when cold with water of heavy pressure to detach all mud and scale; however, in 1869 (page 49) there is a report that "Hays battery" will soften scale after formation. Batteries, although perfect in theory, have heretofore been found deficient soon after they have been put to work, through the mechanical difficulties of getting pure zinc and keeping it in clean metallic contact with some point of iron, oxide of zinc rapidly forming at the junction, thus breaking the contact absolutely necessary for a galvanic couple and electric current. The zinc is well hammered at a definite heat, which changes it from a crystalline friable metal to a malleable one, and insures its long existence in an efficient condition. This, in the ocean service of the Canadian Mail line, has stopped the further action of corrosion and loosened old scale. We have not to fight against salt or fatty acids in locomotive boilers, but its success in bad marine boilers justifies experiment being made with it on locomotives. The theory explaining its action in detaching scale is, that at the surface of the iron plate (the negative pole) water is slowly decomposed and the hydrogen gathers and forces off the new scale as soon as it is thick enough to offer resistance. Of all boiler plate preservatives used by the Admiralty zinc has proved to be the most effective. It has been used in rolled slabs 12″ × 6″ × ½″ and one slab per 20 I.H.P., or one foot square of slab to two feet of grate surface.

Pitting.—Pitting can be stopped and the plate brought into a healthy condition by scraping the affected spots and cleaning the surface with a strong solution of soda or petroleum to remove any grease or acidity and then coating with a thin wash of Portland cement. Even so simple an expedient as filling the cleaning pit holes with red lead has, in marine practice, proved quite effectual in preventing any further waste. And as corrosive and pitting action are apparently increased by the partial absence of oxide or scale on the plate, and the whole of it cannot be kept on. due to the handling the steel receives in boiler making ; the better and certainly the safer practice is to remove it completely by washing with a very weak acid solution, protecting the raw metallic surface by rubbing over with black oil (still refuse). Such a surface is less liable to obscure galvanic action, and as long as it is kept clean will certainly transmit heat and deliver it to water more freely (see R. Wells' experiment, 1879, page 80). That there was less pitting in steel than iron boilers was Mr. Ledgley's opinion (1877, page 54), and recent experiments and extended experience and observation tend to confirm this statement, except when local galvanic action is started, and galvanic action will not start, or at least will not give any trouble, when like metals are acted upon under similar circumstances ; therefore, iron rivets should not be used with steel plates.

Furrowing at Joints.—This subject has been much discussed (see 1872, page 56; 1877, page 61; 1873, page 73, etc.) with the resultant opinion that furrowing was due to chemical or corrosive action on a surface or point at which expansion or alteration of shape was localized In addition to the cause before given for this localization, we would call attention to the injury done to barrel plate at the line of rivet holes in passing it through the rolls after drilling or punching, the lessened resistance there permitting the end of plate to make adecided set, thus: (see sketch below)—instead of bending uniformly to curve. Such rough measures are occasionally used by careless workmen in bringing the bent edges back to true curve as to make a good opening at this point for acids to work upon.

Recent Experiments.—Experiments have been carried out on the C., R. I. & P. Ry., with the "Coventry Boiler," illustrated by plate 27 A, page 42, in the 17th report, and Mr. T. B. Twombly, under date of March 12, writes the committee as follows.

"In reply to your inquiry regarding 'Coventry Boiler' will say that this engine ran some 2,000 miles on our road. I did not subject her to any scientific tests, but ran her for 600 miles on freight service against engine No. 291, carefully weighing the coal to each engine and having them pull 30 loaded cars each way, cars of as nearly even weight as possible. The result appears on the small blue print inclosed, which shows that our engine ran 36.96 miles to a ton of coal and the 'Coventry' 33.24 miles.

"The engine was handled by one of our engineers who knew the road perfectly, and although he might have done somewhat better had he been more acquainted with the engine, yet I call this a fair practical test. I think it reasonable to presume that no amount of fine handling would cause her to show any decided advantage over our engine.

"The 'Coventry Boiler' is 60″ in diameter, placed on an ordinary 3-wheeled engine with cylinders 17″ × 24″, and weighs something over 40 tons.

"Our engine No. 291 has a boiler 56″ in diameter, cylinders 17″ × 24″, and weighs 36 tons.

"I made no investigation into her evaporation. A man employed by Mr. Coventry put a pyrometer in her front smoke-box, close to the flue sheet, and he reported 900° of heat when engine was working hard, dropping down to 400° when working lightly. Of course I do not know how accurate this is.

"She ran for a week or two on one of of our suburban trains, doing very good work and throwing very few sparks. She is a nearly perfect spark-arrester. She ran one trip on one of our heavy express trains (12 cars), and lost time each way. She is not what would be called a 'free steamer.'

"It requires considerable more work in the round house to keep her cleaned out than it does with the ordinary boiler, as her back smoke-box fills with cinders, which must be shoveled out of a small door, and her flues seem to fill up very fast.

"The original cost and cost of repairs will be considerably more than on present style of boiler, and altogether I do not think that as at present constructed her advantages will compensate for the increased trouble and expense."

COPY OF BLUE PRINT.

C., R. I. & P. Engine, No. 291.	Coventry Engine.
1884.	1884.
Nov. 13...... 9,400 coal taken.	Nov. 13...... 8,100 coal taken.
" 13...... 4,000 " "	" 13...... 4,000 " "
" 15...... 9,150 " "	" 15...... 9 700 " "
" 17......11,150 " "	" 17......11,300 " "
" 17...... 4,000 " "	" 17...... 4,000 " "
Total.......37,700 " "	Total.......37,100 " "
5,250 left over.	1,000 left over.
32,450 coal used.	36,100 coal used.
Miles run, 600.	Miles run, 600.
Miles to 1 ton coal, 36.98.	Miles to 1 ton coal, 33.24.

Percentage of work performed with the Coventry engine as compared with engine No. 291, .90.

In closing this report the committee wish to state that the credit for the labor expended in collecting the material for this review and the working it into shape is entirely due to Mr. J. Davis Barnett, one of the members of the committee.

They also desire to return their thanks to Mr. T. B. Twombly, Gen. M. M. of the C., R. I. & P. Ry., for his kindness in furnishing the experimental notes on the result of the trial with the Coventry boiler.

Respectfully,

JACOB JOHANN,
J. DAVIS BARNETT,
ALLEN COOK.

Mr. Isaac Dripps sent a letter and some drawings of boilers made in 1835, for 18 × 30 anthracite freight engines.

Mr. Lauder thought it important to preserve drawings of road devices. "Brand-new" devices, thirty years old, turn up daily; and these drawings would fight off patent cranks. The combustion chamber had been tried in all sorts of ways.

COMMITTEES.

Messrs. H. L. Cooper, H. S. Goodwin and R. H. Briggs were appointed a committee on the place for holding next meeting; J. N. Lauder, William Swanston and David Clark on nominating new officers; and T. B. Twombly, I. M. Boon and R. W. Bushnell on subjects for next meeting.

A paper was read by Mr. Willard A. Smith, of the *Railway Review*, associate member, on the Legal Requirements Upon the Mechanical Departments of Railways.

A vote was taken on a motion to allow a Mr. Lawson to read a paper on Boiler Explosions. Permission was granted and the paper was read. It consisted principally of advertising and advocacy of a patented device which the patentee claims tends to prevent explosions. The paper also contained a great many untrue allegations about boilers and the condition of engineering knowledge respecting boiler explosions. At its close it was moved that the paper be laid on the table and not printed. A lively discussion ensued and the motion was carried only by 22 to 21.

THE REPORT OF THE COMMITTEE ON BOILERS

was then taken up for discussion in sections.

Use of Steel for Boilers and Fire-Boxes.—Mr. Setchel had heard that some master mechanics considered iron as good as steel for these purposes, and he hoped there would be a free expression of opinion on the subject.

Mr. Sprague favored steel for boilers and fire-boxes, but not for rivets.

Mr. Smith, of the St. Louis Bridge Co., said that he had abandoned steel in favor of iron for fire-boxes five years ago. Their water is rather bad, and they had much trouble with the fire-boxes giving out when they used steel, but iron had lasted much better. The iron used was Low Moor, Tennessee and Coatesville.

Mr. Blackwell had trouble with iron as well as steel, when he tried the former in hopes it would give better results than steel with bad water. Low Moor iron had proved unsatisfactory. For two years his steel fire-boxes had shown no defects, while iron often needed attention in a month, it was so badly given to blistering.

Mr. Setchel said that thirteen years ago the Ohio & Mississippi road bought 40 locomotives from the Baldwin Works and 10 from the Grant Works. At the end of twelve years no fire-boxes had been renewed, and the engines had been in hard service running from 4,500 to 5,000 miles per month all the time. Such material must be good. In regard to Mr. Smith's engines, the service was nothing compared to regular runs. It was just like switching. He could take leaky boilers of the road and put Mississippi or Ohio water into them, and they would work well in switching. He thought Mr. Smith's engines must have got mud-burned to give out so soon. On the Miami road, twenty years ago, they used the Ohio water to unscale and clean the boilers. If any member knew of any great failure of steel for boiler purposes, he hoped the convention would hear from them; for the Association was in constant receipt of questions relating to this matter from all over the world, and it was only by hearing from the members that full information could be supplied.

Mr. Blackwell agreed with Mr. Setchel about the duty that could be got out of engines in switching service after they become unreliable on the road. One of their engines with a badly cracked fire-box had done good switching service for years. They were compelled to abandon one brand of iron on the Norfolk & Western road because it acted like steel. Some of their locomotives had run only from 4 to 18 months when the fire-boxes needed renewals.

Mr. Shaver had used steel for fifteen, and had no cracked sheet in twelve years. He did not want any iron.

Mr. Turreff had been using steel entirely for twelve years, and had no reason to find fault with it. He would not go back to iron.

Mr. Woodcock spoke highly of the reliability and durability of steel fire-boxes, which he had been using for fifteen years. He had made over 400,000 miles out of them, burning anthracite coal in fast passenger service, which spoke well for the material. Several engines had made over 100,000 miles without going into the shop, and were yet good for 75,000 miles more. Several of their engines had been in service fifteen years with steel fire-boxes, and the original crown sheets are still in use. They use ¼-inch side sheets of open-hearth steel, which is homogeneous and makes no blisters, but cracks occasionally.

Mr. Meehan said his road had 160 locomotives with mostly Otis steel fire-boxes. The steel had stood well, but there were eight or ten iron fire-boxes which had to be taken out, they gave so much trouble with blisters.

Mr. Barnett said that Mr. Purdy, an English railway man, was given figures by the Pennsylvania Railroad Company of 91 engines with average mileage before a fire-box failed, of 209,926 miles. One even had made 505,890 miles.

Mr. Stevens asked what constituted a failure.

Mr. Barnett replied, what required a complete renewal of the fire-box.

Mr. Setchel said it was generally understood that when a fire-box cracked it had failed, and it was better to take it out then.

Mr. Stevens said that was not the way they regarded the matter on the Lake Shore. If a crown sheet was kept clean it would wear out two flue sheets, and a flue sheet would outlast two pairs of side sheets, as the latter got hottest. He moved that it be declared that the sense of this meeting was, that steel was the proper material for the inside of fire-boxes. This was carried unanimously and closed the discussion on the subject.

The next clause introduced was

Drilling vs. Punching.—Mr. Setchel said that when steel was first brought into use for fire-boxes, the best members advocated drilling the sheets, but they had by degrees dropped with the practice of punching, and this was now the common practice. He understood there had been experiments made in Europe which indicated that punching was preferable. He thought if the Association had made an error in advocating drilling, they should find it out and put themselves right.

Mr. Barnett thought the English tests referred to were those in which the rivets were parted, not by straight tension, but by a shearing strain. Naturally, rivets in punched holes would resist such a strain better because the sharp edges left in drilling would cut the rivet.

Mr. Woodcock thought it depended on the punch and kind of steel. With crucible steel it would be better to drill, but with open hearth steel punching was preferable. This was the view steel makers took.

Mr. Sinclair said that last year Hoopes & Townsend, of Philadelphia, made a series of careful tests with sheets that had been drilled, and others of the same size that had been punched. They found that the punched sheets stood considerably more tensile strain than drilled sheets.

Mr. Barnett said that these experiments seemed to be conclusive. Soft steel was used.

Mr. Lauder believed that 99 per cent. of the members would continue to punch their plates, so the discussion might as well be closed.

Power Riveting.—Mr. Sprague said that when the establishments were small they could not use power riveting conveniently. He preferred set riveting. With a set he had driven 325 rivets in ten hours.

Mr. Lauder said that railroads could not generally afford the machinery needed for power riveting. He thought the question as to the best way of driving rivets by hand was more to the point than how to drive by machinery. He got better work driving by a button-set than by any other method. He got three rivets this way for one that would be driven in the old fashioned style.

Calking.—Mr. Sprague used a round-headed calking tool and found it made good work. He thought sheets should be chamfered before calking.

Mr. Setchel said that the committee believed that by making the pitch larger and increasing the size of rivets, power riveters would do work that would be tight without calking. He used button-set riveting and calked the seams, but would like to hear suggestions that would enable him to abandon calking.

Mr. Barnett explained that the statement as to the high pressure without weakening the joints was not made by persons interested in the sale of hydraulic machinery, but by Mr. Fletcher, inspector of the largest boiler insurance company in the world.

Crown Stays.—Mr. Sprague had used "rods screwed through both crowns with their ends riveted," as recommended by the committee, and liked the plan, but it could not be followed where the dome was over the fire-box.

Mr. Whitney asked if there was not trouble with the flue sheets of boilers stayed in this way. He understood that when the fire-box became hot there was an upward thrust, the outer shell resisting, which resulted in damaging the flue sheet and pulling the holes oval.

Mr. Blackwell said on the Shenandoah Valley road they had 48 engines stayed in this manner by direct stays through the crown and outside shell, and also at the sides in the Belpaire style, and they had given no trouble.

Flues.—Mr. Sprague objected to the practice recommended by the committee of brazing the ferrule to the flue. He did not think that was necessary.

Mr. Setchel said that the more joints they had the greater was the trouble in keeping them tight. Brazing the thimble on made one less joint and he considered it a good plan.

Mr. Swanston had tested the matter by putting into a boiler one half the tubes brazed and one half not brazed. He found there was least trouble with the brazed tubes, and they now braze them all.

Mr. Barnett said that one of the committee had an unbrazed tube expand and play to and fro in the ferrule. It leaked and was remedied by brazing.

Mr. Lauder thought the proper practice in this matter would depend upon the section of the country. In districts where water was bad brazing would be necessary, for the flues got hotter where much impurities were inside the boiler, and tended to push through the flue sheet. He thought there was no need for brazing thimbles on Eastern roads.

Mr. Setchel had used two or three sets of steel flues, but had trouble in keeping them from leaking till he welded on iron ends. Steel flues were thinner than iron ones, but they would not work without safe-ends.

Mr. Whitney had also used steel flues, but also put on an iron safe-end.

Several other members mentioned that they had used steel tubes, but in every case they found "safe-ends" necessary. These were pieces of iron tube about six inches long, about No. 10 wire gauge in thickness, and welded on to the end of the thinner steel tubes.

Hollow Stays.—Mr. Swanston said that he uses 2-inch tubes and puts seven or eight in a side. He thought they aided combustion and prevented smoke. There was no trouble of any kind experienced in using these hollow stays.

Mr. Setchel stated that when they began to put in hollow stays the engineers laughed at the idea, but the steaming of the engines improved so decidedly that all wanted them put in. He called for others to state their experience with hollow stays.

Mr. Hatswell said he put in air flues in the front and back of a fire-box, and they did so well in fuel saving that he put in another lot. These had done well until extreme cold weather came on, when the flues began to leak. He shut up the front openings by putting a plate over them, and there was no more trouble with leaky flues. He had tried a steam jet to prevent smoke, and it worked well when the engine was working light, but not with heavy trains. He used these arrangements in combination with the brick arch and extension front.

Mr. Briggs had considerable experience with hollow stay bolts, and believed that their greatest merit was acting as detectors of broken stay bolts.

After a little more discussion, in which nothing of special value was said, the discussion on boilers closed.

IMPROVEMENT IN VALVE GEAR.

The committee on this subject were Messrs. Charles Blackwell, John F. Devine and M. M. Pendleton. The report was read by Mr. Blackwell. To obtain the required information, the committee issued a circular containing the following questions:

1. Have any improvements in locomotive valve gear come under your notice? If so, name them, and if possible, explain by sketch, tracing, etc.

2. Are such improvements patented?

3. What advantages are to be gained by the use of such improvements?

4. If a better distribution of steam is obtained, please illustrate this by indicator diagrams taken from an engine fitted with such improvements, as compared with others taken from an engine not so equipped?

5. How does the cost of the construction of such gear compare with that of the ordinary gear? Please give figures obtained from actual practice.

6. Please illustrate by figures obtained from actual practice the difference in cost of maintaining such improved gear as compared with the ordinary gear.

7. Have any improvements in the details of the ordinary link motion come under your notice? If so, please describe the same, and if possible, explain by sketch or drawing.

8. Are such improvements patented?

9. What advantages are to be gained thereby?

10. If you can give any information bearing on this subject, and not covered by foregoing questions, you are respectfully requested to furnish the same.

About 5 per cent. of the parties to whom circulars were sent in this country replied in any way; whereas about 80 per cent. of the circulars sent to Europe were promptly and fully answered.

Judging from the replies it would seem that apart from those using the Joy gear, Messrs. Mitchell and David Clark, of the Lehigh Valley Railroad, are the only men in the United States who have lately been experimenting with valve motion of a different character to that in general use; but until these experimental gears have been fully tested it would not be proper to describe them as improvements. The design of the gear used by Mr. Mitchell was furnished by Mr. George S. Strong, of Philadelphia.

Mr. Strong has kindly furnished blue prints—illustrating his valve gear as designed for a six-coupled 12-wheeled passenger engine. There are four valves, two for steam and two for exhaust, and of the vertical gridiron type, giving about 28¼ square inches of port area each. The movement of valves is obtained, as clearly shown, from the connecting rod and the regulation of same by exhaust, altering the position of blocks sliding on fixed quadrants. As in the Joy gear, the lead is constant at all points of cut-off.

Mr. David Clark has been good enough to furnish your committee with blue prints of a 20x26 in. 10-wheeled engine fitted with an independent cut-off combined with link motion; also, in tabular shape, a number of indicator diagrams taken from a passenger engine fitted with similar valve motions and showing its capabilities. With this gear six eccentrics and rods, four rock-shafts, two reverse levers and rods, and two additional valves, valve seats, valve stems and stuffing-boxes are required. This, of course, means considerable extra cost of construction and maintenance, and yet it remains to be proved whether the advantages gained are equivalent to this additional cost.

A valve motion, which, on the authority of the *Railroad Gazette*, January 18, 1884, gave excellent distribution of steam and was invented by Mr. A. J. Stevens, General Master Mechanic of Central Pacific Railroad, was fitted to the Southern Pacific Railroad engine El Goberado, building at that time in the Central Pacific shops at Sacramento. As no communication in reference to the performance of this engine has been received by your committee, it is taken for granted that the valve gear has not been satisfactory and cannot be considered as an improvement. In this, however, they may be mistaken and are open to correction. [This belief was modified in a supplementary report, which contained a letter from Mr. Stevens, speaking highly of the performance of the engine fitted with his valve motion.]

Your committee understands that the Walschaert gear had been applied to several engines built by the Mason Machine Works of Taunton, Mass., and upon inquiry are advised by Superintendent Meats that the cost of construction of this valve motion is slightly greater than that of the ordinary link motion, but the cost of maintenance somewhat less on engines of latest design with large wearing surfaces, and the distribution of steam much evener. The lead of this gear is constant. Your committee is indebted to the Mason Machine Works for blue prints showing various modifications of this gear as applied to engines built by this firm.

Mr. Meats' further remarks will be of interest: "Your question whether I could consider the so-called Walschaert gear an improvement over the ordinary link motion seems to admit of both negative and affirmative answers.

"Affirmative because of the quicker release and more uniform and diminished depression which it gives; negative because these advantages are not sufficient in amount or practical importance to outweigh established usage.

"For narrow-gauge engines or others in which it is desirable to place the valve motion wholly outside of the frames, the Walschaert gear seems well adapted and in every way preferable to the link motion; but for engines which permit a good and easy arrangement of the latter it would hardly seem worth while to adopt the former.

"Now with regard to the comparative admission, cut-off, release and compression of the two motions the Walschaert is more uniform (especially in compression), *i. e.*, if the motion was properly designed; for as far as my experience goes much greater care is required in locating the centers of this than of the ordinary link motion.

"While I am sorry to be unable to send you the comparative results in tabular form, I may generalize by saying that although the Walschaert motion is the more speedy by virtue of its quick release and uniform compression, these advantages are not sufficiently great to justify me in an opinion that it is better for locomotives of all classes."

As no mention is made of this gear in replies to the circular, it is taken for granted that the gear is not considered an improvement over the ordinary link motion; or that circulars did not reach those using engines equipped with the Walschaert gear.

The only new valve gear positively reported to your committee on the ordinary link motion is what is known as the Joy valve gear, and is extensively used in England on marine as well as locomotive engines.

The report proceeds to quote at great length opinions of different mechanical engineers respecting the Joy valve gear. Foreign superintendents of motive power, and locomotive builders, mostly speak favorably of the Joy motion, as it has several advantages over the link motion when applied to inside connected locomotives. The American engineers and master mechanics who wrote about the Joy gear had nothing to say in its favor. Several English engineers expressed a preference for the Allen link over the shifting link, the point made in favor of the former being that the lead is constant at all points of cut-off. The report concludes:

Your committee, judging from replies received by them, are of opinion that, although several experiments have been tried, no material change which can be pronounced as an improvement has been made in this country to the ordinary valve motion of locomotives. On the other hand, they find that in England the Joy gear has been several years in use and as there applied is favorably reported on by representative locomotive engineers of that country.

Mr. Charles Blackwell said that balanced-valves might have been included in the paper, but he was not sure that the subject came within their province. He was favorably impressed with balanced-valves, and thought they reduced the wear of the motion.

Mr. Setchel wished to know if the members generally considered that increase of lead was detrimental to a high-speed engine.

Mr. Swanston did not think constant load was an improvement. Some years ago the Little Miami road had an engine with a stationary link, and they found it an improvement to increase the lead on the backing eccentrics so as to affect the opening while going ahead.

Mr. Sinclair believed from his experience with the indicator and in running locomotives, that providing the means of increasing the lead as the links were hooked up to be a decided advantage. Where the lead is constant, the valves have to be set with excessive lead to get the engine to work smartly. An engine on the Long Island Railroad, with the Walschaert motion, has $\frac{3}{8}$ inch lead. With $\frac{1}{8}$ inch lead the engine would not run. With the shifting link the lead is small when the engine is running slowly, and as speed increases and the links are hooked back, the maximum lead is given at the right time to prevent back pressure in the cylinders.

Mr. Lauder thought that one of the chief advantages of the link motion was that it increased the lead at the right time. He believed in a long radius of link, about 72 inches. He liked the link and had seen nothing superior to it, for it is a simple, cheap, and efficient valve gear. With a short-link radius, the increase of lead might be excessive, but that could be avoided by care in designing the motion.

Mr. Blackwell objected to the increase of lead, owing to the excessive compression which it entailed. He thought the matter need greater investigation.

Mr. Lauder did not think actual loss resulted from compression unless the steam line came above the initial pressure. If compression merely brought the pencil up to the initial pressure, there was no loss; and greater compression seldom happens with a well-designed engine.

Mr. Setchel had run a locomotive with a stationary link, and found that those with increasing lead did the better work. About a year ago he had tried a locomotive with the Joy valve gear, and it could not run high-speed trains, which he attributed to the absence of increasing lead. If the increase of lead is not a disadvantage, and he believed it was not, the shifting link is the best valve motion in use.

Mr. Lauder mentioned that the Joy gear admitted of 12 inches more fire-box.

Mr. Barnett said the Joy gear does not give equal distribution of steam in front and back gear. The motion was taken from the connecting rod, and did not give the same steam opening going forward and backward. It was a defective reversing gear.

Mr. Woodcock preferred the Allen valve, because the increase of lead made it suitable for high-speed engines.

Mr. Setchel used the Allen valve with same lead as other valves, and finds it works well that way.

Mr. O. H. Thomas said it appeared from the report that it was in England where they use drivers of very large diameter and comparatively low piston speed, that the Joy gear with its constant lead is approved. With the high piston speed common in this country, more compression is necessary; hence the success of the shifting link.

Mr. Strong said that the amount of compression necessary to make the engine pass its centers smoothly is in proportion to the clearances. With large clearances it is necessary to close early in the stroke to get up to boiler pressure. In an engine with a constant exhaust, a closure of 3¼ inches is enough to pass centers quietly at a speed of 80 miles an hour.

DEVELOPMENT OF RADIAL VALVE GEAR.

Mr. Otto Gruninger read a historical and analytical paper on the above subject. It was profusely illustrated by drawings which showed the development and the capabilities of radial valve gears.

When the paper was read a motion was carried to receive it. Mr. Setchel asked if that meant incorporating it in the report with its many drawings. This raised some discussion, but the matter was eventually referred to the executive committee. A vote of thanks was given to Mr. Gruninger for the paper.

PLANS FOR CONSTRUCTION AND IMPROVEMENT IN LOCOMOTIVES.

The committee investigating this subject were Wm. Woodcock, G. W. Stevens and A. W. Sullivan. They sent out the following circular of inquiry:

Your committee to whom was referred the subject of "new plans of construction and improvement of the locomotive," respectfully requests your co-operation in furnishing to them any information you may have bearing on this subject in the line of the following questions, viz.:

1. Have you made any improvement in locomotive boilers or fire-boxes?

2. Have you designed any new plans or built any locomotives other than what are now considered as standards? Please furnish tracings of same.

3. Have you made any improvement in the manner of lagging locomotive boilers or the covering of any parts heretofore exposed? Please furnish details of same.

4. Have you made any changes or improvements in locomotive frame, pedestal, braces, etc.? Please furnish detailed plan of same.

5. Have you effected any improvement in the construction of engine and tender trucks? Please furnish tracings showing detail of the same.

6. Have you made any change in plan of making cross-heads tending toward improvement of same?

7. Have you made any improvement in manner of supporting and securing the boiler to the frame of the locomotive other than the usual pads or braces? Please furnish tracing showing detail of same.

The committee will be pleased to receive photographs, tracings or blue prints of any improvements you have made or have knowledge of that will be of interest and benefit to the association.

From the limited number of replies received to this circular, the committee inferred that little improvement had been done during the last year, or else the members were too modest to mention the facts.

"However," continues the report, "we believe that the continued depression in business on our railroad forbids any radical changes in the construction of the locomotive at present. A number of new plans or theories of new construction have been brought out during the past two or three years, but they have failed to produce the desired results or warrant their adoption. The tendency among our master mechanics now is to so construct the locomotive as to reduce the cost of repairs and secure greater efficiency of service by the use of good material, workmanship, and exercising proper care of the same when in service. Mr. M. N. Forney, mechanical engineer, has furnished your committee with a series of cuts, describing plan of improvement of the locomotive in the matter of increasing traction, also position of driving wheels to permit of increased width of firebox, also manner of coupling engine and tender together with truck to support weight of both combined, also manner of adjusting weight on driving wheels by using steam or air cylinders; also plan of equalization with springs or levers. Mr. Forney advises that no engine has as yet been built from these plans, but is looking forward to the near future when they shall be put in practice."

The committee had received from the Baldwin Locomotive Works a description of the "Decapod" locomotive, illustrated in the CAR BUILDER for June, and the description was embraced in the report.

A ten-wheel locomotive, recently built by Mr. David Clark, of the Lehigh Valley road, is described as follows:

"The fire-box is adapted for burning anthracite, coal-dust or slack from the mine. The grate arrangement used in this fire-box is a combination of water tubes and wrought iron bars; the bars are placed in between the water tubes in sections, supported and connected by cross shafts, and form an arrangement by which the bars can be rocked or moved to clean fire.

Another feature of this engine is the arrangement of an independent cut-off valve in connection with the usual link motion. In a recent trial of this engine, Mr. Clark says the performance was quite satisfactory and engine steamed freely. It will be noticed that this is quite a large boiler, and fire-box is placed on top of frames. Boiler and fire-box are built of steel, having a total heating surface of 2,063 feet. The principal dimensions are as follows: Gauge, 4 feet 8½ inches; cylinders, 20 × 26 inches; tubes, 275, 2-inch diameter, 1,890 square feet; fire-box, 11 feet long by 3 feet 3 inches wide, 173 square feet; total heating surface, 2,063 square feet; grate area, 40 square feet; travel of valve $4\frac{9}{16}$ inches, outside lap $\frac{7}{8}$ inches, inside $\frac{1}{16}$; lead of valve, $\frac{3}{32}$ to $\frac{7}{32}$ inches; travel of cut-off valve, $3\frac{1}{16}$ to $4\frac{13}{16}$ inches; steam ports, 1¼ × 17 inches; exhaust, 2½ × 17 inches; weight of engine with fire and water, 109,600 pounds; weight on drivers, 92,000 pounds; weight on truck, 17,600 pounds; weight of tank, 55,000 pounds.

H. S. Bryan, master mechanic of Chicago & Iowa Railroad Company, furnished blue print of new plan of constructing crown sheet for fire-boxes, the peculiarity being that crown bars are not used; the sheet is made up in section as shown, insuring the requisite strength. Among the advantages claimed are:

1. Greater strength obtained.
2. A better circulation of water.
3. All parts of crown sheets are accessible and can be readily washed off and kept clean without removing braces.
4. Liability of mud and scale collecting thereon is avoided.

Mr. Bryan states that this style of crown sheet has been in service for the past seven years with very satisfactory results.

Mr. Geo. W. Stevens, superintendent motive power of the Lake Shore & Michigan Central Railroad, in reply to the subject of lagging for covering locomotive boilers, furnishes your committee with blue prints illustrating his mode of covering boilers on that road, which is by placing a sheet of asbestos ¼ in. thick on boiler; on top of this is placed hair felt 1 inch in thickness, over which is placed Kalamein or planished iron. Detail plans of brass extensions for gauge cocks and thimbles for stay bolts are also shown in prints. No data is given of durability and economy as compared with usual mode of lagging with wood. Your committee is of the opinion that a more durable lagging or covering for locomotive boilers is desirable, also as a matter of economy, as wood lagging put on in the usual manner becomes charred or burned, and is also liable to take fire from sparks and cause trouble. We find that a number of our master mechanics are giving this matter attention by testing several kinds of boiler covering.

Your committee finds that the matter of compound locomotives is receiving some attention of late, but we have not sufficient data as yet to present the subject fully before the convention at this time. Mr. J. Davis Burnett, mechanical superintendent of Grand

Trunk Railway of Canada, writes your committee that he expects to conduct some experiments with a compound locomotive recently brought out on their road, it having a high and low pressure cylinder on each side of engine—the distribution of steam being effected by one balanced slide valve working between the two valve faces with the result of not complicating or adding any more parts to the present gear. Mr. Barnett states that this arrangement possesses some advantages over the other systems of compound locomotives now in operation. The results of same will be anticipated and awaited with much interest by the mechanical world.

Mr. T. W. Dean, mechanical engineer, of Cambridge, Mass., furnishes your committee with blue prints and photographs, showing plans of improved locomotive cross-head and guide. The claims for this improvement are: Increased strength and wearing surfaces. The construction of this guide keeps out dust and cinders from the working surfaces. Also, the guide, being of box form, is very stiff; during two years' service on one of the eastern railroads it has given entire satisfaction running in express passenger service. The construction of the cross-head and connecting rod furnishes over double the usual bearing surface for the cross-head pin and is well adapted for express services.

Mr. John Campbell, Master Mechanic of Mahoney Division of the Lehigh Valley Railroad, has furnished your committee with blue prints showing design of new boiler built at their Delano shops for burning anthracite coal, for passenger service. Among the peculiar points noticed in the construction of this boiler are:

1. The extending of side sheets of fire-box 1 inch above top line of crown sheet and front of crown bars resting on the edge of side sheets.

2. On inside of laps the sheets are chamfered ⅛ of an inch in thickness on end of sheet and sharp edge of sheet is rounded off so as to avoid starting fractures on line of inside lap. Mr. Campbell states that all the defects he has had with boilers he has found on line of inside laps. He also uses welt pieces on inside of circular laps, and on longitudinal laps stay bolts ⅞-inch diameter, 4 inches center to center, staggered to position; flues, 2 inches in diameter; holes, 2¾ inches center to center. In setting flues uses copper ferrule in fire-box end. This boiler has wide fire-box, which is placed on top of frames, securing large area of grate surface. The blue print shows plan of frame with plan of supporting boiler by suspension links and pads, securing boiler to frame, also plan of equalizing with springs and levers. The principal dimensions of this locomotive are as follows:

Number pairs of drivers, 2; diameter of drivers, 5 feet 8½ inches; diameter of cylinders, 20 inches; length of stroke, 24 inches; weight of engine with fire and water, 97,500 pounds; weight on driving wheels with fire and water, 68,680 pounds; weight of tender with fire and water, 54,000 pounds; inside length of fire-box, 129 inches; inside width of fire-box, 42½ inches; inside height of fire-box, back 42 inches, front 48 inches; grate area, 5,482½ inches; length of combustion chamber, 5 inches; diameter of boiler, 54 inches; thickness of sheets, steel waste 7-16 inch thick, wagon top ½ inch thick, fire-box ⅝ inch thick; number of flues, 220; length, 140 inches; outside diameter of flues, 2 inches.

In conclusion your committee would recommend that the report and accompanying blue prints be printed in the annual report.

Very respectfully submitted.

WM. WOODCOCK,
G. W. STEVENS,
A. W. SULLIVAN,
Committee.

Mr. Stevens said he understood the report gave the method of lagging on his road, but it only applies to the parts not usually covered with wood. He meant the boiler-head and fire-box.

Mr. Woodcock said they were all anxious to get something more durable than wood for lagging. He had heard of many locomotives being covered with asbestos cement, which was a success.

Mr. Swanston disliked the idea presented in the report of raising side sheets above the level of the crown. He thought it would leave a hollow space where mud would settle and lead to burning the sheet.

Mr. Campbell had built fire-boxes in that way for twelve years, and had no trouble with mud settling.

Mr. Woodcock thought the kind of water used made a great difference. The clear mountain streams that Mr. Campbell's road drew its water from did not contain the element of trouble.

Mr. Sinclair said that in the desire to make greater use of the steam in locomotive cylinders, many master mechanics are looking towards compounding. He thought that by using a better valve gear results might be reached with the high pressure engine that would be almost as good as anything done by compound engines. He spoke of the excellent work got from a single cylinder engine in the steamer "Hudson," where an adaptation of the Corliss valve gear was used which admitted of an early cut-off. We keep increasing the steam pressure, and we ought to have valve gear that would take more work out of the steam. The link is doubtless best for ordinary work, but it is defective in distributing steam of very high pressure. A valve gear that would give free admission and cut-off at 3 inches of the stroke, then permit expansion to nearer atmospheric pressure than at present, would give results similar to those reached by compounding.

Mr. Strong called attention to the desirability and possibility of taking steam at 160 pounds and working it down to atmospheric pressure. With the link motion it is impossible to get a pressure in the cylinders within ten pounds of the boiler pressure. To get within two pounds and cut off at two inches would involve a great gain.

Discussion closed.

REPORT ON LOCOMOTIVE BEARINGS.

To the Railway Master Mechanics' Association:

Your Committee on The Best Metals for Locomotive Bearings would report that they issued circulars requesting information on which to base their report. They have received ten answers to their inquiries.

In answer to the first question, "What has been our experience with metals used on engine and tender journal bearings? Also on connecting rods and other parts of the locomotive?" they have the following replies:

Mr. Charles Blackwell, N. & W. R. R.: "Unless care is excised in selecting the metal and pouring of bearing metal, very different results are obtained."

Mr. John Campbell, L. V. R. R.: "Using all bronze metal bearings for locomotives except under engine truck, for four or five years. The engine truck bearing is a brass gib on top with babbitt on each side."

Mr. J. S. Graham, Buff. Div. L. S. & M. S. R. R.: "Experience has been limited."

Mr. Jacob Johann, W., St. L. & P. R. R.: "Soft metal bearings for engine and tender journal and Babbitt strips in rod and driving box braces, are economical and satisfactory in their operation."

Mr. William Woodcock, P. & R. R. R.: "Journal bearings made of the best copper and tin in proper proportions with the most satisfactory results. Have used a soft metal that produced exceptional wear and mileage, but it could not be relied on under all circumstances, as in case of a hot journal, the metal of bearing would crush or break in pieces. Have had a number of these bearings to run 90,000 miles on journals 3½ in. by 7 in. under passenger coaches, and remain in service until completely worn out. Believe that if this metal were encased in a brass shell of proper strength to sustain the weight, it could be used with very good results and increased mileage over the use of brass alone."

Mr. George W. Stevens, L. S. & M. S. R. R. "Use engine and tender bearings and connecting-rods; bearings made from old metal. The composition is about one of tin to five of copper, and one of tin to seven of copper."

Mr. William Montgomery, P. & R. R. R.: "Use brass with babbitt metal. No new features."

In answer to the second question, "Have you used journals lined with lead or any other soft metal? If so, with what results? Please give composition of metal other than lead; also sketch showing shape and dimensions of bearing; number of square inches of bearing surface; weight carried on journal, and kind of lubricant used. Give weight of bearing when first put in, and loss of weight to each 1,000 miles run; also length and diameter of journal, and loss in diameter from wear." They have the following replies:

Mr. Charles Blackwell: "Hard brass, with babbitt, gives very excellent results."

Mr. John Campbell: "Have used lead-lined bearing with good results," but gives no record of their performance.

Mr. J. S. Graham: "Have used lead-lined bearings with good results. Also with an alloy of lead 80 parts, tin 10 parts, antimony 10 parts, which is preferable to lead, not being pressed out of place as readily as lead, and standing a higher degree of heat before melting. Tracing herewith showing plan of tender journals that are giving good results."

Weight of brass or journal, 11 pounds 6 ounces; maximum weight on same, 8,000 pounds; square inches of bearing surface, 21; lubricant, "Galena engine oil;" loss of brass per 1,000 miles run, 8.29 drams; loss of bearing iron per 1,000 miles run, .00059 inches in diameter; length of journal, 7 inches; diameter of journal, 3.75 inches.

This is from a test of oils recently made with solid "Ajax metal" journals not lined with soft metal, to insure that loss shall be from friction only instead of part soft metal pressing out.

Mr. Jacob Johann: "Use a half shell, with babbitt bearings, for both engine and tender bearings, both with and without babbitt, which will show method of using. The composition of the babbitt is, if the lead is soft, 4 parts of lead to 1 of antimony. If lead is hard, 5 parts of lead and 1 of antimony. For the shells, 9 of copper to 1 of tin. Engine truck journals, which are 5 inches in diameter and 9 inches long, with bearing surface of 54 square inches, with an average weight on each journal of 7,000 pounds.

"Tender truck journals 3¾ inches in diameter and 7 inches long, bearing surface of 26 square inches, with an average weight on each journal of 8,000 pounds. Weight of engine truck shell is 17 pounds, weighing with babbitt 24 pounds. Method of construction shown in sketch. Weight of tender truck shell is 6 pounds, weighing with babbitt 9 pounds. This is also shown on sketch. No experiments have been made as to the loss of weight of journal or bearing by wear."

Mr. William Woodcock: "Have used lead-lined journals with satisfactory results, especially on warm journals; used them on the passenger coaches, the journals of which have been worn hollow by service. On worn axles, the lead-lined bearing will adjust itself to the irregularities without fitting, which would be necessary with solid bearings. The standard bearings for passenger coaches and tender trucks will weigh 8½ pounds. The metal is 6 pounds of copper to 1 pound of tin. Will average 40,000 miles with a loss of $\frac{30}{1000}$ pounds per 1,000 miles run."

The wear of journals, 3½ × 7 inches, is about $\frac{5}{16}$ inch in diameter; number of square inches of bearing surface, 22.

"For driving shaft-bearings, use the same metal as above without babbitt. These boxes give very good results when properly fitted up. We recently took out a set of six boxes from a ten-wheel engine in freight service; weight on drivers, 68,000 pounds. Journals 6½ × 8 inches, cast-iron box. Composition of bearings, 5 of copper to 1 of tin. Mileage, 116,869 miles. Average wear of brasses, $\frac{5}{32}$ of an inch, exceeding 46,000 miles to $\frac{1}{16}$ of an inch. On heavy passenger engines the wear of brasses would average about 8,000 miles per $\frac{1}{16}$ inch."

Mr. George W. Stevens: "Have used lead-lined bearings with good results. Also, with an alloy of 80 parts of lead, 10 parts of tin and 10 parts of antimony. Lubricant used, black oil. Bearings weighed, when put in, 11½ pounds. Average weight lost for each 1,000 miles run, about 1 ounce. Journals 3¾ × 7 inches. No perceptible loss in diameter by wear."

Mr. W. L. Brokaw, W., St. L. & P. RR.: "Use babbitt in about every thing. Allow the babbitt to project about $\frac{1}{16}$ inch so it will wear down to bearing."

Mr. F. G. Brownell, B. & L. RR.: "Prefer the common brass bearings with thin lead-lining."

In answer to the third question, "Have you knowledge of any composition that answers the same purpose as babbitt metal, in connecting rods, etc., that requires a higher degree of heat to melt from friction than babbitt? If so, please give composition;" they have the following replies:

Mr. Charles Blackwell: "Do not use babbitt in connecting-rods."

Mr. J. S. Graham: "I do not know the degree of heat required to melt babbitt metal, but from the original formula (tin 96, antimony 8 and copper 4) I should suppose any of the babbitt metals, so-called, in use nowadays would not be inferior in non-melting qualities.

Mr. Jacob Johann: "Have not used other metal than brass and babbit for connecting rods, except a steel bushing, with which the result was disastrous. Do not think that babbit can be satisfactorily substituted by a metal that will require a higher degree of heat to melt from friction without using a higher grade of lubricant and a more costly one than now in general use. If phosphor-bronze is, as claimed, a partial lubricant, it might prove to be a good substitute. Have never tried it."

In answer to the fourth question, "What kind of metal in your experience has given the best result for driving shaft, engine and tender journal bearings? If any alloy, please give composition, dimension and shape of same, also method of fitting bearings in a cast-iron box." We have the following replies:

Mr. John Campbell: "Use bronze metal bearings for driving-boxes, as shown on print."

Mr. J. S. Graham: "Have known an alloy of 85 of copper and 15 of tin to give good results, and without a competitive test, know of none better. Use, in tender truck journals and driving boxes, gibs filling in on sides with an alloy of 5 of zinc to 1 of tin. Am not sure of the anti-friction qualities of this alloy as compared with other metals, but it requires a higher degree of heat to melt it, and it seems to answer in other respects."

Mr. Jacob Johann: "Use for driving boxes 6 parts of copper to 1 of tin."

Mr. William Montgomery: "Prefer good tough brass for driving and truck boxes; composition, 2 parts tin, 10 copper and 1 zinc."

In answer to the fifth question, "Have you found the inserting of babbitt metal in journals an advantage? If so, to what extent. Please explain method of inserting." They have the following replies:

Mr. Charles Blackwell: "Experiments give contradictory results."

Mr. John Campbell: "Use a brass gib on top and babbitt on both sides."

Mr. J. S. Graham: "Have found insertion of babbitt metal useful."

Mr. Jacob Johann: "Have found the insertion of babbitt metal in journal bearings to be beneficial. They get a bearing quicker with less liability to heat, and have a less wearing effect on the journal."

Mr. J. W. Brokaw: "Use a composition of 4½ to 5 parts of lead to 1 of antimony."

Mr. William Montgomery: "Believe the use of babbitt to be an advantage."

In answer to the sixth question, "What metal have you found to give the best results for connecting and parralel rod bearings; what advantage, if any, is there in solid bushing instead of the square bearing fitted in straps? Is babbit a benefit or otherwise in connecting rods, and how should it be inserted? we have the following replies:

Mr. Charles Blackwell: "Hard brass gives the best results. Solid bushing preferred, if sufficient pin dimensions are admissible. Simplicity and freedom from tampering with by enginemen are their chief advantages."

Mr. John Campbell: "Bronze metal bearings for connecting and parallel rods with the best results. Do not consider babbitt a benefit. Do not use solid bushings. All square bearings fitted in strap."

Mr. J. S. Graham: "Have good results from an alloy with a zinc basis; one not easy to melt; zinc 4 or 5 to 1 of tin. Prefer tin, but have used with success tin 6, antimony and copper, 2 ounces."

The apparent advantage of solid bushings in parallel rods is, less fitted parts, therefore less labor and expense in construction. Less number of parts subject to breakage, wearing parts the bushing only, therefore more easily, cheaply and quickly repaired than when bolts, keys and straps require renewal. Also insurance against being thrown out of adjusting by careless keying."

Mr. Jacob Johann: "For connecting and parallel rod bearings, use a babbitted brass. For rod brass, the composition is 7 parts of copper to 1 of tin. Believe that babbitted brasses for the purpose in question have proved the most satisfactory, both as to economy and practical application.

Mr. William Woodcock: In connecting and parallel rods use all strap rods, square bearings, with good results. Use babbitt metal in all rod bearings of brass, except at front end of connecting rod at crosshead. The metal is inserted in diagonal strips ½ inch wide. Have used phosphor-bronze in rods with good results. With this metal no babitt is used. The parallel rod brasses frequently run 90,000 miles on an average, without being taken down to close up. The straps should be keyed solidly together and let alone."

"These statements refer to passenger engines running 150 miles per day."

Mr. George W. Stevens: The advantages of bush parallel rods are less fitting of parts, less expense, less parts subject to breakage, less cost of renewal. Have found babbitt a benefit in main and connecting rod bearings.

Your committe regret that more information was not received. The subject is an important and at the same time a difficult one to determine what is "the best metal for locomotive bearings." The conditions of service are ever changing. The questions of speed, weight, proportion of parts, rigidity or flexibility of same, lubricant and condition of track, are all important factors to be taken into consideration.

Your committee will recommend that the members of the Association give this matter special attention and make careful experiments to ascertain which of the different metals and alloys give best results as to wear of bearings; also the journals to which they are applied and to the quality and quantity of the lubricant to produce the best results. Also to determine whether or not the advantages claimed for lead-lined bearings in freedom from heating and fitting badly worn journals is not offset by the more rapid wear of the journal, reducing it in a short time to unsafe diameter.

The question of solid bushings in the ends of connecting-rods is also one that should be more closely entered into. The plan for reduced cost of making and keeping in repair over the old style of rods with straps and keys has not been demonstrated by figures obtained from actual results. If it has been, your committee have not been able to obtain such figures.

JAS. BROWN,
J. S. GRAHAM, } *Committee.*
J. P. HARVEY,

Mr. Meehan said he had eight passenger engines running, with solid-ended side rods having brass bushing. One engine has run 130,000 miles without anything being done to the rods. She is in for repairs now, but nothing will be done to the rods, as they need no repairs.

Mr. Blackwell said that on the Shenandoah Valley road they had 40 locomotives with solid bushed side rods. To be successful, solid bushes needed ample bearing surface, and as a rule the present pin dimensions were not large enough.

Mr. McCrum had 40 or 50 engines with solid-end side rods. The bushings were of several kinds, and they worked entirely satisfactory.

Mr. Blackwell said it was necessary to have larger pins. The smallest should be 4½ inches diameter by 4 inches in length. He had tried bronze bushings, but did not find that material so good as hard brass.

After a little further conversation the discussion closed.

REPORT ON STEEL CASTINGS FOR LOCOMOTIVE WORK.

Your committee to whom was referred the subject of "steel castings for locomotive work," would report that they issued through the secretary the following circular of inquiry to all the members of the association:

To the Master Mechanics' Association:

Your committee on steel castings for locomotive work respectfully solicit replies to the following questions:

1. Have you had any experience with steel castings for locomotive work? If so, please say to what extent.
2. Do you believe steel castings can be used satisfactorily as a substitute for iron?
3. Does your experience with steel castings lead you to believe that the material is reliable under all circumstances?
4. What parts of a locomotive do you consider steel castings best adapted for?
5. Taking into consideration the first cost of steel castings, how does the service got from them compare in cost with the service got from iron?

The committee will gladly receive any additional information on the above subject you may have to communicate.

R. W. BUSHNELL,
JOHN BLACK,
T. J. HATSWELL,
Committee.

To this circular the committee received only 14 replies. Although the information elicited was more meager than your committee had reason to expect, it was obtained from master mechanics in all sections of the country and may be accepted as representing fairly the experience of the members with steel castings for locomotive work; several of those who sent in replies had very limited experience with crucible steel, but the general impression was that for purposes to which they had been applied, castings of this material are much more reliable than cast iron, but not so reliable as wrought iron. To this conclusion there was one decided exception, one member having expressed the opinion that steel castings were preferable to cast or wrought iron for general work.

Most of the members heard from have applied steel castings for cross-heads only, and all of them with this experience reported that for that purpose the material is quite reliable.

One member only reported as using crucible steel driving-boxes; one uses link hangers, one eccentrics and two rocker arms made of crucible steel. All the members who sent in replies are agreed that steel castings are more economical than iron where they can be used advantageously. The economy of substituting steel castings for cast iron arises from the superior strength and durability of the former over the latter; while the benefit of using steel castings to replace wrought iron is gained in saving the labor of making forgings, As steel castings can be put exactly into the forms required, a great deal of machine work is often avoided by their application to locomotive work.

In replying to the circular Mr. J. Davis Barnett displayed an intimate and wide acquaintance with the subject of crucible steel castings, and your committee quote the following from his reply:

"They (steel castings) are being substituted in marine work very rapidly and with success. Where it is an object to save weight—as it is in reciprocating parts more particularly—and yet retain strength, they should be used."

Answering query 3, he says:

"Yes, if crucible steel is used and the price is paid; for as Emerson said 'cinder in the iron often means cinder in the price,' and a good price must be paid for so fine a material, but the increased demand will soon lower the price."

A German firm this year (1884) have been delivering crucible steel castings, sound, well finished and very free from blow holes at the same price as castings by the local firms using the cheaper and less reliable processes of Bessemer and Siemens; cost by the ton being about 4½ cents per pound or perhaps 5 cents for small work; whereas on this continent I doubt if satisfactory contracts have yet been made much less than 7½ cents per pound, and I think 9 or 10 cents has been asked.

Steel castings will yet be used for connecting rods and piston-heads, thus lessening the weight of the reciprocating parts requiring to be balanced, and permitting length of cylinders to be shortened. Mr. Webb, of the London & Northwestern Railway, is now casting Bessemer driving-wheels in a revolving mold, thus condensing the metal, but the rim and spokes are fashioned after the style of the forged wrought-iron wheel; that is, they are solid, whereas less metal for the same strength could be obtained if the American hollow system were followed. The hollow column is nature's system, and she is chary in the use of material, as the examination of a limb, bone or a length of wheat stalk will show. The rocker and reversing shafts should be cast hollow, keeping at about their present diameter; the arms should be ribbed. Eccentric straps, sheaves, straps and rods with link blocks and all its connections may be of steel, with advantage to the weight, and in the substitution of castings for smith's work in such small things as bell cranks, throttle levers, door and injector fittings, as well as rocker and reversing shafts, the first cost of manufacture, as well as of machine work will be lessened, as fewer surfaces will need machinery, and those few require less metal to be removed from them. Your committee are aware that when steel castings were first introduced with general machine work they were not found reliable in numerous cases, and many parties abandoned their use after trial. We have reason to believe that the failures were due to a great extent to the inferior work produced in the first stages of a new industry, and that many who abandoned steel castings after the first trial have returned to using them with satisfactory results. In many departments of machine work throughout the country, steel castings are being rapidly substituted for expensive forgings. We see no reason why this material should not be applied to all the details of locomotive work, as recommended by Mr. Barnett, and we think also that it might be applied to the working of cylinders, driving wheels and other parts where increased strength would mean increased durability. The high price of good steel castings is at present an obstacle to their adoption for ordinary purposes, but we believe the law of competition is working to reduce the price, and that it will soon be cheaper, all things considered, to use crucible steel than to use cast iron for many purposes about locomotive work.

There have appeared in some of the leading mechanical journals, lately, articles describing the making of steel castings from old rails and other steel scrap by a process where a common cupola was used to do the milling. Most of the members have probably read the articles. Your committee have received no direct information about this new process, but they think it may prove of great value to railroad companies and that it deserves investigation by the members of the association.

R. W. Bushnell,
Thos. J. Hatswell,
Committee.

Mr. Lauder thought that steel castings would in course of time replace wrought iron for a great many purposes. He hoped to hear a free expression of opinion on this subject. For a wearing surface, cast steel would not work so well as cast iron. He thought the Chester or Eureka, so-called steel castings, made very good cross-heads, but they do not wear well unless they have a brass or bronze gib to run in the guides. So far, he had found it impossible to get cast steel cross-heads to run cool on steel guides. He did not think steel was a suitable material for eccentric sheaves.

Mr. Johann found that steel cross-heads did not run well on steel guides, but nothing could be better than the way steel crossheads ran in cast iron guides. He had tried cast steel rocker arms, but they were so much faster than cast iron that he gave them up. Steel castings were not yet made in a perfect manner, but would doubtless be improved in time, when their use would become general.

Mr. Brownell had had some trouble with a cast steel eccentric cutting the cast iron strap.

Mr. Eastman had used fine Chester steel crossheads, which had run for four years and were but little worn. This was on a road using sand ballast, and the guides had not been touched.

Mr. Hatswell asked what style of guide Mr. Eastman was using.

Mr. Eastman said that the guides were cast iron, and the crosshead solid cast steel. On the engine that had run four years without trouble the guides were three inches wide, but on other engines they were wider.

Mr. Hatswell had experienced the same trouble as Mr. Lauder with guides, even when they were casehardened iron.

Mr. Lauder thought it would pay Mr. Hatswell to use nothing but plain cast iron guides. He would not take steel guides as a gift. Cast iron wore beautifully.

Mr. Finlay asked if Mr. Lauder had to increase the strength of the cast iron guides, and a reply was given in the negative.

Mr. McCrum had tried steel crossheads on steel guides unsuccessfully, but with cast iron guides there was no trouble. He, however, increased the size of guides when they were made of cast iron, and made them of good close-grained iron.

Mr. Stewart had used cast steel crossheads, guides and rocker arms with uniform success. When steel cross-heads were used he employed cast iron guides made a little heavier than those of wrought iron. He had two locomotives equipped in this way that had run 143 miles a day for 13 months with no perceptible wear. He believed that a good engineer who takes care of his oiling is about the best substitute for special bearing surfaces.

Mr. Setchel was gratified to hear the facts stated about steel castings. He had been favorably impressed with the material, and had ordered steel driving boxes put on some new engines, good steel being used. He found that they ran hot even if oil was kept running on them all the time. He thought this trouble would be experienced on any road where curves induced side wear. Before he got the boxes to run well he had to face the hubs of the wheels with brass. He did not think that real steel would run against a bearing surface without cutting. Chester steel might do, as it was only carbonized iron at best. Thirteen years ago his road bought ten engines with bronze driving boxes and wedges. The wear in the jaws was excessive, but when cast iron wedges were used with brass boxes they wore very well. He thought stronger material than cast iron was needed for driving boxes, and brass boxes with cast iron wedges were the best combination.

Mr. Whitney had experience with cast steel crossheads, and was compelled to use brass gibs to prevent cutting. He did not favor cast steel crossheads, but liked cast steel piston-heads, which he had used successfully.

Discussion closed.

MUSEUM OF RAILROAD ANTIQUITIES.

Mr. Lauder, by permission, read a letter from Mr. Baird, of the Smithsonian Institute, giving notice of the creation of a department of steam transportation, both marine and rail, for the preservation of objects connected with the history of steam engineering progress. It also mentioned that Mr. J. E. Watkins was appointed curator.

Mr. J. E. Watkins being present, by invitation, addressed the meeting, saying that a nucleus of the intended collection was already at the Institute. The collection was intended to show the evolution of transportation, and a special annex would be provided for it. The Pennsylvania Railroad Co. had sent the "John Bull," their oldest engine, and the Institute had also received from the Camden & Amboy Railroad Company a piece of the first rail with a base rolled in this country. He asked for the co-operation of the Association, and called on the individual members to send him relics.

[Mr. Watkins is an old railroad man and enters enthusiastically into the work he has been appointed to do.]

The following resolution was passed by the Association:

Resolved, That the American Railway Master Mechanics' Association has learned with pleasure of the establishment by the Director of the National Museum of the Department of Steam Transportation (railway and steamboat) for the purpose of collecting and preserving materials which will illustrate the railway history and development of this country. The Association hereby heartily indorses the action referred to, and recommends that its members, so far as they can, assist Mr. Watkins, the curator in charge, in making such a collection as will fulfill the purposes for which the department has been established.

RULES FOR TESTING BOILERS.

The committee appointed to report on this subject were H. N. Sprague, W. L. Hoffecker and D. O. Shaver. They sent out the following questions by circular:

1. Is the frequent testing of boilers by hydraulic pressure desirable? If so, how often should these tests be made? What excess over working pressure should be applied, and why?
2. Do you recommend other tests in connection with hydraulic? If so, what other tests, and why?
3. Do you consider the test of a locomotive boiler at rest by hydraulic pressure, conclusive as to its safety under all conditions of service?
4. Please give any information you may have on this subject, not called for in the foregoing questions.

Thirteen replies were received in response to 240 of the circulars sent, and the committee express themselves as being curious to know what opinion (if any) the remaining members hold on the subject, and trust they may respond generally in convention. Of the 13 replying to the circular, three are entirely opposed to hydraulic tests, one saying he thinks it an injury to a boiler; and another says he has seen a boiler tested to 120 pounds by hydraulic pressure, that leaked at every joint and was perfectly tight under an equal pressure of steam. Of the 10 members reporting, who favor hydraulic tests, all give decided preference to hot over cold water as giving proper expansion to the parts, and favor the introduction of hot water in preference to firing the boiler filled with cold water, as the want of circulation by this plan is likely to produce unequal expansion; and while some favor frequent tests and others think them only necessary after general repairs to boilers, they all recommend careful inspection to detect pitting and grooving, and hammered tests to detect defective stays and braces. The excess of tests over working pressure recommended by different members, varies from 25 to 40 pounds, and while they do not consider the test at rest conclusive as to its perfect safety under all conditions of service, yet as conclusive as any test under such condition.

After quoting the expressed opinions of various parties respecting methods of testing boilers, they continue:

"Your committee, after a somewhat extended experience in testing both new and old boilers, added to what information they have gained from other sources, would respectfully recommend that all boilers intended to carry ordinary pressure in service, should be tested when new to 180 pounds hydraulic pressure, by introducing hot water, and after the boiler shall have become warm so as to produce uniform expansion, the pressure to be applied, and a careful examination made to determine if any change of shape is produced in any of the parts that would indicate weakness in design or material, and an examination after pressure is removed of stays and braces, to see if any weakness is developed or undue strain thrown upon individual members; for we are thoroughly of the opinion that a new boiler that will not stand a hot-water pressure of 180 pounds without movement of its parts or overstraining, is not absolutely safe to stand the strains of service through its ordinary life.

For all subsequent tests, preceded by a careful inspection, as specially of stay-bolts, by hammered tests, we would recommend a hydraulic pressure by hot water of not less than 25 pounds above working pressure. We consider a pressure test the only perfect one for a boiler, inasmuch as it reaches every point and exposes every defect possible to reach at rest. Defects that, through inadvertence or position, might escape other methods, will not escape this. We also believe hot water to be sufficiently elastic to thoroughly equalize the pressure, and as it will expose a leak more readily than steam, and can be much more economically applied, and is also much more cleanly in its application, we most heartily recommend it as the most proper test available. And now, in conclusion, we approach the question of the frequency of tests with some trepidation, but inasmuch as the efficiency of any method depends upon its systematic application, we are constrained to recommend a periodical inspection and test every 12 months for the first two years of the life of a boiler, and thereafter every six months of all boilers in service.

The following code of rules used by the Pennsylvania Railroad Company to regulate the testing of boilers was embraced in the report:

Boilers of Locomotives.—The boilers of new locomotives must be subjected to a hydraulic pressure of 25 pounds per square inch above their rated working pressure before going into service.

This test must be made once a year for the first two years, and thereafter every six months.

When boilers are being tested, the foreman of the machine shop having under his charge the repairs of locomotives, must attend personally, remaining outside while an assistant examines the fire box from the inside.

A record of all tests must be made, giving dates, and anything worthy of mention, which must be signed by the foreman and the person assisting.

The boiler must be heated to near the boiling point of water before the test is commenced.

Special examination of the stay-bolts of locomotives in service must be made not less frequently than once every week.

An inspector especially trained for the service must tap each stay-bolt from the fire-box side, and judge, from the sound, which of them are broken.

When these examinations are made there must be not less than 30 pounds of steam pressure upon the boiler, which will produce sufficient strain upon the stay-bolts to cause the separation of the parts of broken ones. Should the boiler not be fired up, the examination may be made after drawing all the water from the boiler, in which case the vibration of the sheet, after striking the bolt, will indicate any unsoundness. The latter test is preferable when it can be made without inconvenience.

He must keep an accurate record of the location of each imperfect bolt, and report the same to the master mechanic, who will decide, from the position of the bolts and the construction of the boiler, whether the locomotive must be withdrawn from the service.

No locomotive must be allowed to remain in service when there are one or more stay-bolts broken in the top row.

The dates of all tests of boilers and examination of stay-bolts must be given by the road foreman of engines on their monthly reports to this office.

Stationary Boilers.—Stationary boilers, carrying 100 pounds pressure per square inch, must be tested in accordance with the instructions given for locomotive boilers, including the examination of stay-bolts.

Stationary boilers carrying less than 100 pounds pressure per square inch must be subjected to a hydraulic pressure of 50 per cent in excess of their rated pressure, once in every six months, and a special examination made of the stay-bolts both before and after the pressure has been applied, in the manner proscribed for the examination of the stay-bolts of locomotives.

Stationary boilers of odd types, such as those used over heating furnaces, must be tested the same as other stationary boilers, so far as the pressure and dates of test are concerned, and must be examined with reference to the particular construction of each boiler.

It must be understood that the foregoing rules apply to all boilers, whether located at the shops or at outlying points, and that they are in the direct charge of the master mechanic in whose district they may be placed.

The dates of all tests and examinations must be promptly reported to this office, giving also the general condition of the boilers and noting any stay-bolts or braces found to be broken.

Mr. Blackwell, in speaking on this report, directed attention to the mistake made in calling water elastic.

Mr. Shaver, in reply to a question from Mr. Stevens as to what the Pennsylvania road did about testing the boilers of engines at outlying points, said a man was sent to such places to do the testing. The rules were made for use and were strictly carried out.

Mr. Stevens said that testing stay-bolts once a week was unnecessary. Out of 30,000 examined during one year at frequent intervals, only ¼ of 1 per cent. were found broken.

Mr. Whitney asked if they proposed removing the lagging from boilers every six months for the purpose of testing.

Mr. Shaver replied that this was the Pennsylvania Railroad practice.

Mr. Finlay was in favor of frequent tests, and expressed the opinion that were tests conducted more regularly there would be fewer accidents.

Mr. Briggs believed that the expense of removing flues to make tests every six months would be a too heavy burden for roads that were not now paying fixed charges.

Mr. Whitney said the custom on his road was to examine the boiler thoroughly every time an engine comes in for general repairs. They took off the dome cover occasionally to examine stays of fire-box, and they watched to see that there was no change in the form of the boiler anywhere. He considered that these precautions were sufficient to secure safety.

Discussion closed.

Mr. Johann presented a resolution framed to prevent non-members from reading papers without first submitting them to the executive committee, a most desirable and necessary precaution against using the Association for advertising purposes; but for some inscrutable reason the motion was rejected.

FRANKLIN INSTITUTE NOVELTIES EXHIBITION.

Mr. Lockwood announced that the Franklin Institute, of Philadelphia, would hold a Novelty Exhibition in the fall, and moved that a committee be appointed to represent the Association in experiments to be carried out there,

This was carried, and subsequently President Barnett appointed F. W. Dean, T. L. Chapman, Angus Sinclair, Wm. Woodcock and Charles Blackwell as that committee.

The Secretary read the

REPORT OF COMMITTEE ON SMOKE STACKS AND SPARK ARRESTERS.

The committee appointed at the last annual convention to report on the subject of smoke stacks and spark arresters, issued the following circular:

To the Members of the American Railway Master Mechanics' Association:

Your committee on smoke stacks and spark arresters respectfully requests replies to the following questions:

1. What form of smoke stacks do you use in connection with the ordinary smoke arch? Please give dimensions and results obtained.
2. Are you using any form of spark arresters or extension front ends? If so, state how constructed and results obtained.
3. What has been your experience with the fire brick arch or other device in the fire-box in connection with the extension front as compared with the ordinary smoke arch?

The committee desires to make as full and complete a report as possible, and earnestly requests the members to give us, as early as convenient, any information bearing on this subject, not confining themselves entirely to the questions propounded above, but giving any information obtainable in addition to that requested.

It is also desirable that drawings or sketches giving dimensions of the various devices, be furnished with your report.

These circulars were sent to each member of the Association, to which we received 27 replies.

Your committee were disappointed in the majority of the answers received, in so far that the members have given their experience only in a general way; this arises no doubt from the fact that no comparative tests have been made, which is greatly to be regetted, as such tests would have been of the greatest value toward the solution of the vexed question, "which is the best and most economical smoke stack and spark arrester?"

While we have not met with that general response to our queries that we had hoped to, still we are glad to state that a few of our members have furnished the committee some facts that can be called decisive. The past year has shown little or no improvement in smoke stacks or spark arresters, and when new designs are sifted out they are generally found to be modifications of some older forms. In some of the blue prints furnished the committee, an improvement in details only can be noticed.

The majority of the drawings sent represent the prevailing practice, with which the members are familiar, so that there is no necessity for a discussion of their respective merits or demerits. Mr. J. D. Barnett, of the Grand Trunk Railway of Canada, has sent your committee a blue print of extended front, of which the most notable feature is an adjustable diaphragm plate. This is effected by a shaft passing through smoke-box from side to side. This shaft has three levers, two of which are connected with diaphragm plate, and the third lever is outside of the smoke-box and is connected with a rod leading to the cab, where the diaphragm can be adjusted to any degree thought proper. Mr. Barnett says in answer to the questions propounded: "We are using extended smoke-boxes on our engines, and, although the result is most satisfactory so far as the comfort of the passengers is concerned in freedom from cinders, I cannot say that the amount of steam produced is satisfactory when engine is loaded to its designed capacity of 12 or 14 coaches. The results, both to comfort, are satisfactory with, say 8 coaches." Mr. Barnett further says: "We have always used fire-brick arches in connection with extension fronts, and did so on passenger locomotives before experimenting with extended front ends, so as to lessen the discomfort of passengers. A long and thorough test with fire-brick arches has shown that their expenses in first cost, in repeated renewals and in occasional injury to side sheets of furnace, more than counterbalances any reduction in the first bill resulting from their use."

Mr. Jacob Johann, of the Wabash, St. Louis & Pacific Railway, says he "is trying a device called the Hunter Spark Arrester. This device is, as its name implies, a spark arrester, and with our light trains, where the engines are not forced to their utmost capacity, it works well—the engine steaming well and the arrester performing its duty thoroughly. On heavy trains, however, where the engines are required to work to their full capacity to make running time, the device is apt to become clogged up with sparks, the arch and netting filling up and seriously interfering with the steaming of the engine. Owing to this defect the engine having this device was unable to make up lost time, and in some instances failed to make running time." Mr. Johann states that at last accounts the inventor was trying to overcome this cause of complaint.

Mr. Cushing, of the Northern Pacific Railway, has sent the committee a drawing of a smoke-stack, such as used in the early days of coal burning. He says, "I have used this stack now for 20 years as a standard, occasionally experimenting with others, which have from time to time been brought to notice; but have fallen back on the old device as being in my opinion the best, all points considered. The stack is as perfect a spark arrester as any found in my practice."

Mr. Joseph Wood, of the Pennsylvania Company, has furnished your committee with a number of drawings that indicate the practice of this company in regard to smoke stacks and spark arresters. Mr. Wood says in answer to the circular: "The extended front as shown is considered to give better results as a spark arrester than either the diamond or Smith stack. It improves the steaming qualities of engines to some extent, but does not, so far as this company's experience goes, show any economy in the consumption of fuel over the other forms of front ends in use. Its merit is that it is, in our opinion, an excellent spark arrester, and that it also contributes to the comfort of traveling by rail. A number of devices have been tried in fire-boxes to reduce the consumption of fuel, but none seemed to be of any value except the arch. This device, with and without the extended front, has, where it can be used, shown a marked economy in the use of fuel. From numerous experiments made here and on the Pennsylvania Railroad, I would say that with the arch a reduction of from 12 to 15 per cent. in the consumption of fuel can be had. On one division of this company's lines the coal used contains such impurities that large deposits are formed on the flue sheet during each trip. It is necessary to remove these deposits, and to do so the arch must be removed. The cost of removing and replacing the arch daily is greater than the saving in fuel. On another division, where water is very bad, with the arch there was found a tendency of crown sheet to burn directly over back end of arch where the heat was greatest. With fairly good water and ordinarily pure coal very good results are obtained from the arch."

Mr. J. N. Lauder, of the Old Colony Railroad, has sent your committee blue prints showing the arrangement of extended fronts and the method of getting rid of the sparks. Mr. Lauder says: "It makes a perfect spark arrester and works well in every way," and that he has used this extension front with and without fire-brick arches, and can see very little to be gained by the use of the arch.

Your committee has noticed on the blue print of the extended front furnished by Mr. Lauder, a new arrangement for cleaning the extended front of the accumulated sparks. This device consists of a 4¼-inch pipe, 76 inches long, having an enlarged receptacle in the center of its length. This receptacle has a flange by which it is fastened to the bottom of the extended front so that the pipe will be at right angles to the center line of boiler, and between the smoke arch and forward section of frames. In the receptacle there are two steam jets, which are connected to the boiler below the water line with globe valves. The spark discharging pipes have two sliding gates, one at each end of the pipe; by opening these sliding gates and turning the water on the sparks they are made to pass at right angles to the center line of engine, into a building provided for their reception situated on either side of the track.

Mr. Lauder says in respect to this method of sparking the extension fronts, "We blow the sparks out at the sides because we think it is cleaner than the other method in use. If the sparks are blown out under the engine, with a steam jet, they are thrown over the machinery of the engine; whereas, if blown out from the sides, they can be thrown into a building provided for that purpose."

A series of tests were made on the Cleveland, Columbus, Cincinnati & Indianapolis Railway, to determine the relative efficiency of engine No. 152 under four conditions, viz.:

First—Engine equipped with fire-brick arch, extended front, high nozzle and straight stack.

Second—Extended front, high nozzle and straight stack.

Third—Diamond stack, cone and netting, ordinary smoke arch, short compound nozzle and brick arch in fire-box.

Fourth—Diamond stack, cone and netting, ordinary smoke arch, and short, compound nozzle. (See tabulated statement appended.)

Test of Engine No. 152—Engine and Boiler Performance.

	I.	II.	III.	IV.*
	Fire brick arch, extended front, high compound nozzles, straight stack.	Extended front, high compound nozzles and straight stack.	Fire brick arch, ordinary smoke arch, low compound nozzles, diamond stack, cone and netting.	Ordinary smoke arch, low compound nozzles, diamond stack, cone and netting.
Coal burned in lbs	24,532	23,664	25,000	28,400
Water evaporated in lbs	144,844	144,800	148,068	148,528
Pounds of water evaporated per lb. of coal	5 90	6.12	5.92	5.22
Equivalent evaporation from and at 212° Fah. in lbs. of water per lb. of coal	7.07	7.34	7.10	6.27
Pounds of coal consumed per car mile	7.78	7.60	7.87	7.71
Pounds of water evaporated per car mile	45 95	46.52	46.73	40.36
Cars hauled 1 mile per ton of coal	256.97	263.01	253.44	259.15
Coal burned per sq. ft. of grate per hour	75.80	76.37	84.66	96.46
Water evaporated per sq. ft. of grate per hour	447.65	450 54	501.44	504.50
Running time in minutes	1,100	1,092	1,004	1,001
Time for stops in minutes	200	208	176	214
Total time on tests, in minutes	1,300	1,300	1,180	1,215
Temp. of feed water in deg. Fah	63°	63°	62°	64°
Av. boiler press. in lbs. per sq. in	126	128	127	120
Passenger car mileage	3,152	3,112	3,168	3,680
Engine mileage	552	552	552	552
Average No. of cars per train	5.71	5.63	5.73	6.66

* Note.—On account of change in time card, the car mileage and speed of train were both increased in fourth test.

W. F. TURREFF, General Master Mechanic

Engine No. 152 has 17 × 22-inch cylinders and 5½-feet driving wheels, 17.65 square feet of grate surface, and 751.51 square feet of heating surface.

In conducting these tests every known precaution was taken to prevent any error in the data from which these condensed results were obtained. The coal used was measured in buckets for convenience and also on account of the coal being exposed to the weather. The correctness of the coal buckets was tested by weighing a number of buckets filled with dry coal in the manner as practiced by the men engaged in that work, and the error was found to be less than 0.01 of 1 per cent. The height of water in the boiler at the beginning and end of tests was alike. The water in tank was measured by a boat carrying a graduated rod, and corrections were made for unlevel track at water stations. By weighing the tender with and without water, it was found that each inch in height gave an additional 458.6 pounds of water. The temperature of the feed water was taken at frequent intervals by a Fahrenheit thermometer. Steam was occasionally wasted at the safety valve by over-pressure, but this was avoided as much as possible. Water was wasted every time the injector was started, and our total amounts include this wastage. A careful record was kept of the arrival and departure of the train at each station and at terminal stations, so that the actual running time can be relied on.

Taking the evaporation from and at 212 degrees per pound of fuel as a basis of comparison, and representing the performance of the engine in trial No. 2 by 100, their respective performances will be as follows:

	1	2	3	4
Relative efficiency in the evaporation of water from and at 212 degrees per pound of fuel	96	100	97	86
In car miles (passenger) per pound of fuel	97	100	97	97

Test numbers 1, 2 and 3 can be fairly compared with each other as the loaded car mileages are approximate quantities, but unfortunately in the fourth test the loaded car mileage was greatly increased over the mileage in the other trains and the running time was somewhat shorter. This has resulted in the greater consumption of coal as compared with the three first tests, so that it would not be fair to compare the last without taking this fact into consideration.

The first three tests will show that there is little choice between the performance of the engines fitted up in the manner described so far as economy is concerned; yet taking into consideration the comfort of the traveling public, we think the extended fronts and straight stacks with high nozzles are on that account of some benefit to the road using them, and that with the extended front there is less liability of setting fire to adjacent property along the line of the road, as compared with the diamond stack and cone with netting.

On the Cleveland, Columbus, Cincinnati & Indianapolis Railway a number of tests were made, a few months previous to the one referred to herein, with fire-brick arches in conjunction with the extended front, and the results were anything but satisfactory, the small saving of fuel in some instances being much more than offset by the first cost and maintenance. On some roads having pure coal the results may be different. The coal used on the road referred to is not of the best quality, and they found a great deal of trouble in keeping incrustation from forming on the flue sheet, so that before the arch is burnt out it has to be removed to get out the deposits. As a smoke consumer and spark arrester the brick arch was found to have some merits, but nothing that would begin to justify a railway company in applying and maintaining the device for that purpose alone.

From the reports furnished us we would derive the following conclusions, viz.:

First—Where a railroad company has the advantages of comparatively pure water and coal, they would be justified in the use of the brick arch on account of its economy in fuel, and not otherwise.

Second—An extension front end, when properly constructed, makes a very satisfactory spark arrester, and as a consequence is less injurious to the paint and adds greatly to the comfort of passengers; and are to be recommended on that account. It also has some merit as an economizer of fuel, but not to any great extent.

Third—With comparatively pure water and coal the extension, front end and brick arch can be used in conjunction to advantage both for cleanliness and economy in fuel.

Fourth—The Hunter Spark Arrester seems to have some merits as a spark arrester where a locomotive pulls light trains, but not in cases where heavy trains are hauled; and would seem to require further practical tests before a definite report could be made. No other device has any merits as a spark arrester so far as reported.

Where reference has been made to any special road, the committee submit blue prints, and suggest that they be printed with the report in order that the subject may be fully understood.

W. F. Turreff,
Geo. B. Ross, } Committee.
W. T. Smith,

Mr. Lockwood said that at high speeds the diamond stack choked the exhaust.

Mr. Meehan said he would not let certain statements in this report respecting the brick arch pass without protest. He had used the brick arch extensively, and felt assured it had been the means of effecting a saving in coal of 30 per cent. When it is found that an engine throws sparks an extra brick is added to the usual size of arch, and that always proves a preventive. They support the bricks by tubes and the former become solid after a little use. He could not imagine how any one would suppose that the arch injures the side sheets. They use different kinds of coal, some of which is good and some very bad, but for all kinds the arch is useful and the engines steam freely. It is used in combination with the extension front. They have had consolidation engines in use equipped with this device for two years without the smoke-box door being opened. This alone represented a great saving over the diamond stack, which was a constant source of labor inspecting and keeping in order. In putting up the extension front, the work must be well done, but it pays. The statements he had made were backed by the records of comparative tests. His locomotives would maintain 145 pounds steam pressure against a No. 9 monitor injector throwing 3,000 gallons of water an hour.

Mr. Turreff explained that the report should not be regarded as opposing the extension front and brick arch, but simply as showing that good results could be obtained by old methods.

Mr. Blackwell said with the extension front arrangement they had got good results with slack coal costing 50 cents per ton. The economy was $8 per engine per month.

Mr. Woodcock estimated that the extension smoke-box had effected with his engines a saving of 20 per cent. in fuel. It also prevented spark-throwing.

Discussion closed.

SUBJECTS FOR NEXT MEETING.

The committee on subjects for next meeting reported as follows:

Standard Driving Wheel Centers and Standard Section of Tire.

Driving Wheel Brakes, to what extent is their use advisable and the best mode of application.

Balance Slide-Valves.

Best Material and Form of Construction for Locomotive Guide and Cross-Heads.

Best Plan of Renewing, Cleaning and Resetting of Flues.

Shop Tools and Machinery.

On a ballot being taken for next place of meeting, Boston was selected.

OFFICERS ELECTED.

The election of officers resulted as follows:

President—Mr. J. Davis Barnett, Midland Railway, Port Hope, Ont.

First Vice President—Mr. W. Woodcock, Central of New Jersey, Elizabethport, N. J.

Second Vice President—Mr. J. Johann, Springfield, Ill.

Secretary—Mr. J. H. Setchel, Ohio & Mississippi Railway, Cincinnati, O.

Treasurer—Mr. Geo. Richards, B. & P., Boston, Mass.

Mr. Chas. Blackwell, Roanoke, Va., was elected a new member of the committee on subjects.

President Barnett made a pleasant speech, thanking the association for the kindness they had exhibited towards him. He came among them a stranger and a foreigner, and they received him as a brother. He perceived a great future for the Association, and pledged himself to work hard to forward its interests.

Mr. Johann presented a resolution thanking the officers for their services the last year, which was adopted.

The committee on resolutions submitted resolutions, which were passed, expressing thanks of the Association to J. B. Edmunds, president Commissioners District of Columbia; Rev. B. Sunderland; the committee of arrangements; the committee of entertainment; the proprietor of Willard's Hotel; the ladies, and the members of the press, for courtesies extended.

The convention then adjourned.

Western Railway Club.

The regular monthly meeting of the club was held in its rooms at Chicago, July 15. There were present Charles F. Pierce, B. K. Verbryck, Allen Cooke, H. Burkhardt, E. N. Lewis, P. H. Patriarche, J. J. McCarthy, Willard A. Smith, W. J. Dickinson, J. W. Ross, A. B. Burtes, J. M. Rogan and W. B. Snow.

President Pierce occupied the chair and gave a short inaugural address, that being the first meeting since he was elected. He said the railroad interests in Chicago have much at stake in this club, and the members of the club have unparalleled opportunity to influence railroad operations, since they were located in the middle of the most important railroad system in the world. He urged the members to make intelligent efforts toward uniformity of standards, and thanked them for the honor they had conferred upon him in electing him president of the club.

NEW MEMBERS.

The following new members were elected: Angus Sinclair, National Car-Builder; G. W. P. Atkinson, Atkinson & Co., 116 La Salle street, Chicago, and Mr. Wheeling, Cook County Iron Co.

APPLIANCES FOR PREVENTING THE SLIDING OF WHEELS.

By Automatic Brakes: The above having been mentioned as the subject of discussion, the President called on Mr. Snow to open the discussion, as he suggested the subject.

Mr. Snow did not know of any better way to find out the best plan for preventing wheel-sliding than for each member to tell how he works the brakes and arranges the levers. He believed the Westinghouse directions give too much leverage, and he does not follow their plan. He arranges the leverage to suit the weight of the empty car and of the rolling parts of the truck. He found a good many things that operate to slide the wheels, one leading trouble being the unequal distances the pistons move. He fixes the movement at six inches, but the brakeman or fireman will go back, at the orders of the engineer, and take up the slack, which disarranges the whole thing, so that when they come to apply the brake one piston will be out eight inches and another three inches, and the one that is out the most will hang when the wheels start and cause them to slide. Another thing is the carelessness of some engineers. One man will put on the wind for all it is worth and slide the wheels, while another engineer will take the same train and run it for six months without having any sliding wheels at all. I have sometimes thought we could put a spring, but that would hardly be practicable, as each car, with weights varying from 5,000 to 9,000 pounds on a wheel, would need something to graduate the brake. Probably the best way would be to have a school where engineers would be made to understand thoroughly the brakes and how to use them. That might obviate the trouble.

Mr. Cooke said the pressure of air carried made a great difference, and he found in looking through the engines that there was great difference in the pressure carried on the air drum. Some engineers are not satisfied with the proper pressure and they increase the tension on the safety valve that regulates the pressure on the drum. If your lever is fixed to work at a certain pressure and 20 pounds more be added, it will apply the brake much harder. His greatest trouble was in getting the brakes off after they were on. The brakes drag so much that he figured, to pull seven cars on a train that stopped frequently, it took a 16-inch cylinder engine to do the work that could be done by a 15-inch cylinder engine without this extra work of pulling brakes. Part of the evil was in the engineers, who were always in a hurry to start from a station and would not wait five seconds for the brakes to come off, although they would gain time by so doing. He wanted to hear some means to release the brakes quickly.

Mr. Snow had considerable trouble from brakes not releasing quickly, but found it was caused by the triple valve spring getting weak. When they put in stronger springs the trouble ceased.

Mr. Cooke had tried a coiled spring to assist in releasing the brake. The lever would set some four inches before it touched the spring, but when the brake was applied with full force there was considerable pressure of the spring against the lever, which would give the piston a start back. That works well, and he had them on several coaches.

Mr. Snow said they had very little trouble with the flattening of wheels on suburban trains, although the stops are very frequent. The greatest trouble is on the road, and yet they say they do not use greater pressure of air. They use straight air.

Mr. Verbryck said they were using the Westinghouse Automatic Brake on all their passenger cars, and the levers were arranged according to the directions given by Mr. Westinghouse. The greatest trouble they had with the brake was in its not releasing promptly, but he believed part of the blame rested on the engineers. The greatest trouble from the brake sticking is in the winter, when the triple valve freezes up. He believed this was caused by water being permitted to accumulate in the reservoir. On the main line they had very little trouble with flattened wheels, as the engineers were experienced men, who handled the brake with judgment.

Mr. Cooke had found trouble of the same kind last winter through the engineers permitting water to collect in the reservoir. During extremely cold weather they had to use straight air, and found the stops could be made better, although it was not quite so safe. For that reason he returned to the automatic as soon as the cold weather was over.

Mr. Verbryck did not believe in changing from the automatic. His orders were to cut off the air altogether from a car if there was trouble with the brake dragging.

Other speakers mentioned having trouble with the triple valve freezing up, and all believed it was due to water being permitted to collect in the main reservoir.

Mr. Snow, in reply to a question, said they built their suburban cars to weigh from 31,000 to 32,000 pounds.

Mr. Verbryck said they had never built suburban cars so light as that. Their ordinary passenger cars are all pretty much of one standard, now weighing about 38,000 pounds. He builds suburban cars to weigh about 33,000 pounds.

Mr. Snow said their suburban cars were built as light as possible. Some of the road cars weigh 50,000 pounds.

Mr. Sinclair said that much ingenuity had been devoted to inventing a device that would keep the brake applied so long as the wheels were revolving, but would cause release so soon sliding began. There were mechanical difficulties in perfecting such a device, and nothing satisfactory had yet been produced. He believed that sliding of wheels must be prevented by the care of the man handling the brake, but the brake appliances must be properly adjusted. On some roads the men who handle the brake are all that could be desired, but on other roads some of them are not well posted about the brake mechanism. Some training would improve such men, and would be better for the railroad companies.

Mr. Cooke mentioned that when the brakes are applied quickly, the tracks being sensitive will tip at one end. Thought this would have a tendency to slide the wheels.

Mr. Snow believed that when wheels are not round they have a tendency to slide. It is not when the brake is first applied that the wheels slide most readily, but when the speed has slacked down to near stopping.

Mr. Verbryck said when Mr. Snow found that a wheel was not round he should follow their plan and put it into a grinding machine, where it would be made round.

Mr. Snow was happy to say that they had not quarter the trouble from sliding of wheels they once had. He favored a school for engineers. He thought it would be possible to put a valve inside the cylinder that would let the air escape when the pressure was too great.

Mr. Sinclair thought the governor that had recently been applied to the Westinghouse brake would answer the purpose of keeping down the pressure to the point the Master Mechanic wished. He had seen it working on Eastern roads, where it was highly spoken of.

Mr. Cooke was putting on a governor, and he would be able to tell them how it worked by next meeting.

Mr. Snow did not think the governor would help them any. A car starts where they are using 60 pounds pressure, and passes on to a division where 90 pounds are carried, and there the wheels will be slid. He thought the best way to prevent sliding would be to charge every flattened wheel to the man who caused the damage.

Mr. Sinclair: If you have a car running on a division where you are using 60 pounds of air, and it goes to a division where they run a longer train and have to carry 90 pounds to operate the brake promptly, you cannot blame the engineer for sliding the wheels of the car whose levers were adjusted for 60 pounds pressure.

The subjects for next meeting are: The best method and material for lubricating locomotive valves and cylinders; and the seating of cars for suburban traffic.

Rock Island Car Shop Notes.

Mr. B. K. Verbryck, General Master Car-Builder of the Chicago, Rock Island & Pacific Railway, says work is very light in the shops at Chicago at present, but from what we noticed during a ramble round the shops along with Mr. Pullman, the Master Car-Builder, we would have been disposed to call the works busy, when their appearance was compared with the condition of many car shops we have visited recently. They are building six new passenger coaches, three of them for ordinary road travel, and three for suburban traffic. The former are 50 feet 8 inches long, and the length of the latter is 45 feet. Both kinds of cars are very handsomely finished inside in cherry and maple. The monitor roof is finished in ornamental canvas work, and the lower deck in paper. It has hitherto been the practice of this company to fit out their suburban cars with side seats at the ends, and reversible ones in the middle portion of the car. Passengers did not like the side seats, and the new cars are built with reversible seats throughout, a somewhat unusual concession to popular prejudice. In the way of new freight car work, they are turning out what is equal to one box car a day. The box cars now made are 34 feet long instead of 28 feet, as was just recently their standard. In the longer car all the parts are strengthened, posts and braces being much heavier. They are still using what is called their standard diamond freight-car truck, with swing center, wooden transom and diamond bars 3 × 1 inch. The wheels now put under this truck have been recently materially increased in weight, and most of those we saw bored ready for the axle ran about 610 pounds each. They are Bass wheels, and are used under passenger and freight equipment, and are reported to give excellent service. There are some very strong flat cars, 33 feet long, in the shop, newly finished.

In the line of repair work they have two Pullman cars, one chair car, and one dining car undergoing a course of renovation, which includes painting, varnishing and reupholstering. There are also several ordinary passenger cars undergoing repairs, but the heavy passenger business at present going over the road prevents the taking in for repairs any thing that can be kept out. Not so with freight cars, however. This is the season of freight discontent, and the cars are standing round everywhere. From a rough estimate made round the tracks at different stations, there are about fifty miles of empty freight cars waiting in the vicinity of Chicago for something to do.

The Chicago, Rock Island & Pacific car shops are particularly well supplied with power tools for working in the iron and wood entering into car construction. In fact, the policy followed is to do nothing by hand that can be done better and cheaper by machinery. We might safely venture to predict, that there are not half a dozen members of the Master Car-Builders' Association who can turn out work so cheaply as can be done by President Verbryck. The whole place bears the strongest evidence of the able and careful management that controls the smallest details, banishing dirt, slovenliness and waste.

Richmond (Va.) Railroad Shops.

EDITORIAL NOTES.

During the interval between the recent Master Car-Builders' and the Master Mechanics' conventions, we were able to make a brief visit to Richmond, Va., which was done with the view of looking up the railroad mechanical attractions of that city. From Old Point Comfort the journey was made over the Chesapeake & Ohio Railroad. The previous trip made by the writer over this road was ten years ago, and the experience made a deep impression that is still quite legible. It was a night journey over a road-bed that was in decidedly bad order, and the constant click of the chair joints, the surging over rough spots of track, the bumping on low joints, and the jerking of a badly coupled train, did not act as a soothing lullaby. The journey altogether was one of the kind that is remembered more for its novelty and excitement than for comfort or pleasure. With that curious force of association that looks for recurrence of experience in old surroundings, we looked on getting into the train for some of the reminders of our former ride, but none were to be found. The cars were clean, handsome vehicles, equal in finish, comfort and appearance to anything found on other first-class roads; and the road-bed and track were in keeping with the cars. Before reaching Richmond we realized the full meaning of the reported improvement on Southern roads during the last five years, and every day of our stay there deepened our impression of the reality of rapid progress in that region.

The first railroad visit made was to the mechanical offices of the Chesapeake & Ohio Railroad, where we were kindly received by Mr. T. L. Chapman, Superintendent of Motive Power, who willingly provided us with facilities for examining the work to be seen in drawing office and shops. Mr. Ettinger, chief draftsman, has a well arranged office, and an admirable system of doing work to which we will devote greater attention at a future time. In looking over the locomotive drawings, we observed details of a method Mr. Chapman had designed for obtaining improved combustion in the locomotive fire-boxes. He put an inside lining to the fire box through which he admitted air to the surface of the fire, the air becoming partly heated as it passed up between the lining and hot sheets. It worked very well, but the iron sheets employed as a lining burned out rapidly, and Mr. Chapman intends substituting a more refractory substance. He has a novelty in the shape of an ash-pan. Believing that great loss of heat resulted from the unrestrained rush of cold air through the ordinary dampers, he designed means of admitting air freely through the sides of the ash-pan. Slotted openings admit a full supply of air while the dampers are shut, and good means are provided for graduating the admission and for closing the openings completely when the engine is not at work. Mr. Chapman is favorably impressed with the economy that can be practiced by using the extension front arrangement, and he is equipping his engines with that device as fast as they go into the shops for general repairs. He has had gratifying success with single nozzles, one of his consolidation engines being at work on heavy service with a nozzle 5½ inches diameter. The netting used on this engine has two meshes to the inch, yet with these wide openings she throws no fire.

This company's shops at Richmond are kept merely for division work, and there are not many hands employed. In the course of a ramble round the place with Mr. O. H. Thomas, Master Mechanic, we found that he was making numerous changes with a view of improving the facilities for turning out work promptly and at lower cost. Several of the engines have their boilers covered with asbestos, and, so far as this material has been used on the road, it gives promise of much greater satisfaction than wood. All the engines have springs inserted between the spring-hanger and the frame, making practically a system of double springs. The engines are said to ride very smoothly, and broken driving-springs are almost unknown, which seem to be direct testimony in favor of the practice. Where straps are used on main and side-rods, a hole is drilled through the flange of the truss at the bend of the strap, so that the latter can always be inspected for the appearance of incipient cracks. This practice has led frequently to the detection of cracks, and the requisite repairs were made without the intervention of a breakdown on the road. All tenders belonging to the Chesapeake & Ohio Railroad have their holding capacity painted on their sides. Diamond trucks of the same pattern as the standard freight-car truck are used for carrying all classes of tenders, and they are said to stand the hard service very well. The truck is very similar to that recommended as the Master Car-Builders' standard.

Mr. J. N. King, Master Car-Builder, at Richmond, was overhauling five passenger cars, but he had no new work on hand.

The finest railroad machine shops at Richmond are those belonging to the Richmond & Danville Railroad Company. They are situated on a level piece of ground on one bank of the James River. These shops form the mechanical headquarters of the road, and they contain facilities for manufacturing almost every article required for rolling stock and buildings. Mr. R. D. Wade, Superintendent of Motive Power, walked around with us and pleasantly explained every operation of the works. He is enthusiastically in favor of every road being self-sustaining so far as rolling stock and track appliances are concerned, but he believes in the work being done as well and as cheaply as it can be bought. He is building four new passenger coaches, every part of the material being taken from the territory traversed by the road, and the whole of the work being done by the company's employés. There are capacious drying kilns connected with the works, where all the lumber is dried. The interior finish of the new passenger cars is very neat and artistic, the carving, which in some respects is unique, being done in the works. Part of the interior decoration is in selected maple, and part in a birch which is found on the line of the road. The latter wood has a most strikingly beautiful grain, and the effect on the whole as a decorative wood is excellent. The wheels for the cars are made in the works, and Mr. Wade says they get as high as eleven pounds of iron to the pound of coke, a Colliau cupola being used. They make all the truck parts on formers, the work of building the truck uniformly being facilitated by the use of gang drills and other special machinery.

There is nothing being done in the locomotive shop beyond repairs, and the work in that line keeps them busy. They expect to close their tracks from 5 ft. gauge to the standard soon, and all the rolling stock has been built so that the change can be effected with the least possible work and expense.

Some time ago Mr. Wade applied the Joy valve gear to one of his ten-wheel locomotives, but it did not work satisfactorily; and on the sliding block breaking after a few months' service, the whole thing was abandoned. A curiosity noted in the working of this motion was that when running on the road the valve would at times have as much as three-quarters of an inch more travel than it would have when the wheels were turned in the engine house.

Connected with these works they have a very well-arranged electro-plating laboratory, where all the electro-plated work used on cars, station ornament, etc., is done. The work turned out appears equal to anything of the kind produced at Eastern establishments devoted to the business.

While looking through the fine paint shop of the works, Mr. Wade showed us a most curious method of transmitting graining. A painter brushed a coat of paint over a clean oak plank, then he took hold of an implement like the segment of a wheel, covered with leather. This he rolled over the wet paint, then rolled it on a clean board, and the grain of the oak was found transferred to the clean board. They use this mechanical style of transferring graining for a great many purposes, and its use effects an important saving in time.

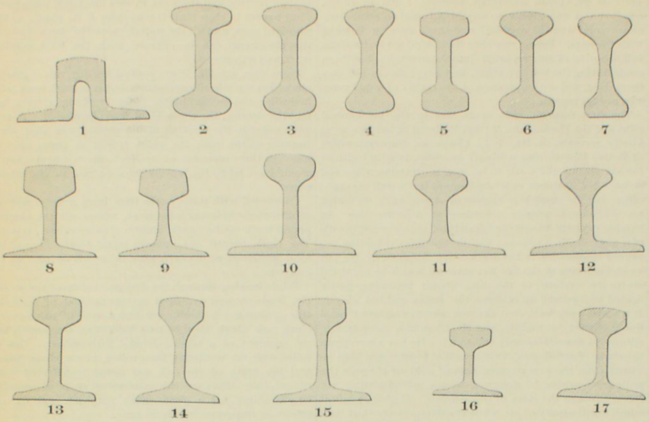
During the greater part of a sun-roasting afternoon, we lounged round the shops of the Richmond, Fredericksburg & Potomac Railroad, listening to Mr. H. Kuhn, Master Mechanic, and Mr. W. H. Trainham, Master Car-Builder, relating the hardships of railroad operating during the war times. Outside of the machine shop, an old locomotive boiler is lying, which, during the war, was built to run a small car to the front. The boiler is only 60 × 24 inches, and the cylinders, which are fastened vertically to the side of the boiler, are 3½ × 6 inches. They transmitted power to the driving axle through a gear wheel, but the total power was very limited, for when the car was full the soldiers had to get down and help the engine to start it on a level, and when a grade was reached they had to walk or push till the top was reached.

They are building a new mail car in these shops 50 feet long, to carry 40,000 pounds load. The axles are 4¼ × 8 inches. The car has a double floor, and the body of the car is strongly braced by four 1¼ inch-truss-rods.

Most of the locomotives belonging to the road have outside engine truck bearings and extension fronts. While we were there, an agent of the Hutchinson smoke-consumer was equipping one of the engines with that device. The company contemplate erecting new car shops soon, on a plot of ground beside the machine shops. At present the work is done in open sheds.

Draw-Gear Repairing.

Car-builders have for a long time shown a tendency to make car construction conform to the one object of making repairs easy. For the attainment of this end, designs have been modified again and again without increasing the strength, durability or usefulness of the structure, but quite often the result has been a serious diminution of these very essential qualities. To provide for easy methods in the making of repairs, forms of construction are frequently condemned, not because of defects, but because such forms involve departures from local standards and necessitate changes in repairs. In the adoption of such standards, one of the strongest arguments urged in their favor is that repairs will be more easily and cheaply made; as if this was of paramount importance as compared with strength and durability. The extent to which weak and insecure forms of construction have been tolerated, and even elaborated into standards, is hardly realized by car-builders themselves. As an illustration we may refer to the prevailing draw-gear apparatus as applied to freight cars, comprising draw-timbers, followers, castings, straps, etc. That the various types of these details, and the general arrangement of which they are component parts, should continue to be adhered to so universally, can only be accounted for on the ground or theory of easy repairs. The whole construction is unmechanical, and there can be little doubt that at no very remote period of railway progress it will give place to something better. It must be admitted, however, that repairs can easily be made; so easily in fact that it would be difficult to devise methods for making them much easier. The trouble is, there is too much of this easy repairing to be done. It is the quantity which costs, and for which the ease and facility with which each particular job can be done is no fair offset. The question has been broached whether it would not be possible by better designing and construction to do away with a very large proportion of this class of repairs. On some roads, in years past, fifty per cent. of freight-car repairs has been due to draw-gear breakages. The proportion is now somewhat less, but it is still very large, and will continue to be so until forms of construction shall come into vogue that have other merits to recommend them aside from their convenience in repair shops.



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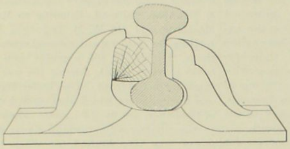

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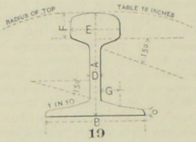

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Rail Sections.

BY EDWARD E. R. TRATMAN.

The subject of rail sections is one that has been treated of in a more or less general manner by a large number of writers, but in this paper I propose to deal solely and in detail with those sections now in actual use in different parts of the world, without reference to old-fashioned types or the numerous designs which are as yet only in the experimental stage.

Although nearly every important line of railroad throughout the world has a section of rail peculiar to itself, yet there are in fact but three standard types, from which others differ in detail only. These are the "Bridge" rail, the "Double-headed" rail, and the "Flat-footed" or "Vignolles" rail, also known as the "Flange" or "T" rail, the first of which is so little used in comparison with the other two that I should have omitted mention of it but for the fact of its being designed for a radically different type of permanent way to that usually employed, namely, longitudinal timbers instead of the usual cross-ties. The other sections may therefore be practically considered as the standard types of the world.

The Bridge rail (Fig. 1) was designed by Mr. I. K. Brunel for his pet line, the Great Western Railway (England), and although it was adopted at the time by other English roads, the Great Western is the only one which still keeps to this section. It is in use, however, I believe, on some of the older Canadian lines. Incidentally I may mention that the G. W. R. is a broad (7′ 0″) gauge road, with longitudinal timbers under the rails, the gauge being maintained by timber transoms at intervals. This rail, though deficient in strength considered as a girder, is admirably adapted for the above method of construction, since, having a continuous bearing, it is not subjected to the girder strains pertaining to rails laid on cross-ties, while it is enabled to be of a lighter weight than would be required for the usual arrangement of ties under the same conditions of traffic. It has the advantages of a wide base and small height (which reduces the tendency of the wheels of trains to force it outward and spread the track), and above all, the head is solidly supported throughout its entire width, and has no overhang as the heads of other rails. The outer vertical planes are perpendicular, while the inner ones are somewhat inclined, the thickness of the metal diminishing gradually from the center of the head to the extremity of the flange. The upper face is flatter than is usual, and does not tend to groove the wheels of rolling-stock so much, and there is a good depth of head for wear and tear. It stands very satisfactorily under the heavy traffic to which it is subjected, but for standard gauge branches the company have adopted a double-headed section on cross-ties.

The "Double-headed" rail, though not used in this country, is the usual type adopted on English railroads, and is used also on the principal lines in the English colonies, as well as to some extent on the European continent and in other parts of the world. This rail has, as its name implies, two heads, which are connected by a thin web, the original intention being that when one head was worn down, the rail should be reversed and the other head brought into use. At present, however, this plan is not carried out to any extent, since the impact of the traffic is found to indent the lower face, where it is supported in the chairs, to such an extent that when it becomes the running face an unpleasant vertical jerking motion is given to passing cars, so that it can easily be known when a train is passing over reversed rails. At one time various methods were tried of supporting the lower face in the chair on a cushion of wood or felt, etc., but these are little used now, owing to the complication of the different parts, and Mr. W. B. Adams' invention of supporting the rail by irons fitting into the recess between the heads, and thus suspending the rail, has never attained to any extensive use. It will be at once seen that such a section possesses no inherent stability, and these rails have, therefore, to be supported in chairs (Fig. 18) varying in weight from 25 to 40 pounds each, of cast-iron, in which they are secured by wooden, or in some cases metal, "keys." A chair is placed under each rail on every tie, and serves not only to support the rail, but to distribute the weight of passing loads over a large area of the tie. This section of rail, with its solid system of permanent way, is particularly adapted for the strong and durable construction of English railroads, and is well suited to the constant and heavy traffic over them.

Taking first the London & North Western Railway (England) section (Fig. 2), it will be noticed that the heads, which are broad, project sharply from the web and are somewhat shallow, thus giving but little depth for wear and tear; while they overhang to a considerable extent, so that under heavy traffic the edges are likely to give way. The next section (Fig. 3), a rail of the North Eastern Railway (England), has the heads less broad and somewhat deeper, and swelling more gradually from the web, giving a more durable and economical form of rail. The third rail of this section, that of the Paris, Lyons & Mediterranean Railway (Fig. 4), is unique; the running faces are very slightly curved, the heads are narrow and deep, and run very gradually into the web; this section has the heads well supported; in fact, there is rather an excess of metal, giving the rail, which is very strong, a somewhat clumsy appearance. The next section, Great Indian Peninsular Railway (Fig. 5), is one of the very few having the sides of the heads formed by vertical planes; the heads are fairly deep and are well connected to the web; the rail, although light, is strong and serviceable. The section of the rail of the New South Wales Government Railways (Fig. 6), was adopted by Mr. John Fowler, M. I. C. E., consulting engineer of these lines, and is considered a good standard type of this class for steel rails. The curves are well proportioned, and the heads strong and deep. The sides of the heads are almost complete semicircles with a radius of .59 inch, running into the web by reverse curves of .55 inch radius. The last figure of this class of rail represents that in use on the Great Eastern Railway (England), and illustrates what I have before mentioned of the reversing of these rails. The engineer of this road, seeing that the lower table of the rail was practically useless for traffic, adopted the section shown in Fig. 7. It is double-headed but not reversible, the lower table being merely large enough to secure a firm seat in the chair and give the key a good grip. The upper table is broad and somewhat shallow at the edge, while the running surface has a flat curve. Near London there is a very heavy and continuous traffic over the line, which the rails stand exceedingly well, proving substantial and economical. This rail, too, differs from the foregoing sections in the form of its web, which, instead of having parallel vertical sides, is thinnest in the middle, widening out toward the heads by diverging planes.

Coming now to the consideration of the "Flange" or "T" rail, we have to deal with the most extensively used section of the three, and the one which has the greatest variety of shapes: it requires no chairs or other support beyond the spikes which hold it to the ties, and proves reliable under heavy traffic. It is the section universally employed in this country, but the tendency here has been to use too light a section; engineers are now, however, remedying this defect. The first section given of this class of rail is that of the New York, West Shore & Buffalo R. R. (Fig. 8), which is a good solid looking rail, with a large and deep head, the sides of which incline outward from the top (a very general style in this country, though I believe not adopted elsewhere, and it would be interesting to know how the nature of the wear of this style of head on wheels compares with the wear from rails with rounded heads). The upper face of the flange is of one plane on each side, running off by short curves into the web. The New York, Lake Erie & Western rail (Fig. 9) is very similar to the last; the head, however, is not so deep, and the lower surface, where the fish-plates take their bearing, is plane instead of being curved, as is more usual; and inclines upward from the web, which is thinnest at the middle. The next, an English section, that of the West Riding, Hull & Grimsby Railway (Fig. 10), is very different; the head is deep but round, and runs gradually into the web; it is a very heavy rail and has an extremely wide base, while the flange has nearly the same thickness throughout. Fig. 11 shows a rail of the London (Eng.) Metropolitan Railway, which has the widest base of any rail now in use; it was specially designed to carry the enormous traffic of this line, is not very high, and has a well-proportioned, round head, thick web and a tapering flange. The Great Northern & Western Railway (Ireland) has a rail of the section shown in Fig. 12; the top is but slightly curved, and the head, which is rather too shallow at the edges, runs gradually into the web. All the previous sections of this type have had wide bases and the flange increasing regularly in thickness from the edge toward the web. The next one, however, that of the Paris, Lyons & Mediterranean Railway (Fig. 13), has a very narrow base, disproportionate to its height, while the upper surface of each side of the flange is composed of two planes, somewhat sharply inclined to one another, giving a great thickness of metal near the middle; the web is tall and the head fairly deep, with vertical plane sides. The rail of the Dutch Rhenish Railway (Fig. 14) is also high, with a narrow base; the short, thick flange runs into the web with wide curves, and the head also curves very gradually into the web; the base, however, in this as in the previous section, is too narrow for the height, and much heavy traffic would tend to overturn the rail or force it outward, necessitating a considerable amount of inspection and repair to keep the track in good order. Fig. 15 shows the rail of the Egyptian Railways, which is well proportioned, but for its weight and height should have a wider base. The flange runs by two planes into the web, which is thin and tall, ½ inch thick in the middle and $\frac{9}{16}$ inch thick at a distance of one inch above and below. The head is well supported, its sides curved to a radius of 2.25 inches (the width of the head), joining on to the upper and lower faces by curves of ⅜ inch radius, which is also the radius of the curves connecting the web with the flange and head. The Egyptian Agricultural Railways have a light rail of the section shown in Fig. 16, which has a wider head than the last in proportion to its depth and base. The next section (Fig. 17) is that of the Indus Valley Railway (Indian State Railways): this, too, has the upper surface of the flange in two planes; the head is broad and sufficiently deep, and has a narrow vertical plane side rounded off at top and bottom with curves about 38 inch radius. The planes of the upper part of the flange and lower surface of the head are inclined to one another at an angle of 60°.

The following dimensions for a rail section were suggested in the report of a German railway committee: Depth of rail, 4·95 inches; depth of head, 1·25 inches; breadth of flange, 4·15 inches; thickness of web, ·55 inch.

The question of the radius of the running surface is somewhat complicated: the New South Wales and Egyptian sections have a radius of only 5 inches, the radius of the N. Y., L. E. & W. R. R. is 10 inches, that of the Indus Valley rail is 18 inches, and others range as high as 24 inches, while 40 inches has been advocated as most suitable. Upon this point, however, every engineer has his own opinion, and a comparison of these opinions would prove both interesting and instructive, and might lead to the adoption of a standard radius.

In conclusion I have given the section (Fig. 19) recommended as a standard by Mr. Molesworth, of the Indian State Railways. It is neatly proportioned, but the top curves of the head seem rather too abrupt. The dimensions common to all rails of this section are as follows:

Radius of upper corners of head	.5 inch.
do. lower do.	.2 "
do. curve from head to web	.2 "
do. do. do. web to flange	.2 "
do. do. at corner of do.	.2 "
do. running surface	18.0 "
Inclination of outer plane of flange	1 in 10
Angle of lower surface of head with horizon	15°
do. upper plane of flange do. do.	15°

The other dimensions are given in the annexed table (Table D), which is taken from Mr. Molesworth's "Pocket-Book."

TABLES OF DIMENSIONS.

Table A.—Bridge Rail.

Fig.	RAILROAD.	Height.	Width at top.	Width of flange.	Thickness of flange at edge.	Weight per yard
		Ins.	Ins.	Ins.	Ins.	Lbs.
1	Great Western	3	2.31	6.25	.45	68

Table B.—Double-headed Rail.

Fig.	RAILROAD.	Height.	Width of heads.	Thickness of web.	Weight per yd.
		Ins.	Ins.	Ins.	Lbs.
2	London & North Western	5.35	2.75	.80	84
3	North Eastern	5.30	2.50	.80	82
4	Paris, Lyons & Mediterranean	5.12	2.36	.79	74.75
5	Great Indian Peninsular	5.00	2.35	.89	68
6	New South Wales Government	5.25	2.50	.63	75
7	Great Eastern	5.00	(upper) 2.50 (lower) 2.00	.62	65

Table C.—Flange Rail.

Fig.	RAILROAD.	Height	Width of head.	Width of flange	Thickness of flange.	Thickness of web	Weight per yard
		Ins	Ins.	Ins.	Ins.	Ins.	Lbs.
8	New Yo k, West S. & Buffalo	4.50	top, 2.23 bot., 2.39	4 50	....	....	67
9	New York, Lake Erie & Western	4.25	top, 2.25 bot., 2.37	4.25	at center, .74	.50	63
10	West Riding, Hull & Grimsby	5.00	2.50	6.00	.55	.69	83
11	Metropolitan	4 20	2.50	6.37	nr. web, .55 at edge, .40	.74	86
12	Great Northern & Western	4 25	2.50	5.20	....	.60	69
13	Paris, Lyons & Mediterranean	5.12	2 37	3.95	nr. web, .75 at edge, .40	.63	72 75
14	Dutch Rhenish	5.15	2.32	4.00	....	.55	68
15	Egyptian	5.00	2.25	4.50	at edge, .31	.50	70
16	Egyptian Agricultural	3.52	2.00	3.25	at edge, .25	.36	42
17	Indus Valley	4.50	2 25	4.00	nr. web, .87 midway, .43 at edge, .37	.32	60

Table D.—Molesworth's Section.

FIG. 19.	Mark	WEIGHT OF RAILS IN LBS. PER YARD.									
		30	35	40	45	50	55	60	65	70	75
Height of rail	A	3.00	3.25	3.50	3.75	4 00	4.25	4.50	4 75	5.00	5.25
Width of flange	B	2.80	3.00	3.20	3.40	3.6	3.80	4.00	4.20	4.40	4.60
Thickness of "	C	.24	.25	26	.27	28	.29	.30	31	.32	.33
" " web	D	.34	35	.36	37	38	.39	40	.41	.42	.43
Width of head	E	1.60	1.70	1.80	1.90	2.0	2.10	2 20	2 30	2.40	2.50
Depth " "	F	.85	.97	.99	1.15	1.22	1.27	1.30	1 33	1.36	1.36
Width of fish-bed	G	.50	.55	.60	.65	.70	.75	.80	.85	.90	.95

Cedar Rapids (Ia.) Shop Notes.

We extract the following shop and machinery notes from a private letter written by Mr. R. W. Bushnell, Master Mechanic of the Burlington, Cedar Rapids & Northern Railway. Notes of this kind are very interesting to railroad mechanical men, and we would be pleased to receive similar particulars of what they are doing from as many master mechanics and master car builders as possible. By supplying information of this kind for publication they will confer favors on the whole railroad fraternity.

Mr. Bushnell says: Business keeps up quite fair here, but not in proportion to the number of new miles of road, consequently our people are inclined to have the expenses kept down as low as possible; yet they have not ordered any general reduction, as they did last year. In order to prevent as far as possible the necessity for such a reduction in this department, I have decreased the working hours equal to nine hours a day, quitting at 11 A. M. Saturdays. When any of the men quit we leave the places vacant, unless in special cases where that would cause inconvenience. The stringency, fortunately, did not prevent us from getting a few new tools. Within a short time we have received a 36-inch planer, a 72-inch radial drill, a double-headed axle lathe, and we are now just getting in a double-headed driving wheel lathe, all of them being from the Niles Tool Works. In addition to these, we are putting in a large steam pump with a capacity of about 800,000 gallons a day, for pumping our own water.

By the above you will see that we are not altogether standing still, but, on the contrary, are progressing steadily. We have had six engines in the repairing shop most of the time since the new year. We are putting new cylinders on Nos. 76 and 55, and No 14 is just out with an extension front, low nozzles, and a straight cylindrical netting extending from the nozzles up to the stack. I was somewhat afraid lest the engine might not steam well, but she has made one trip to Burlington and back, and Simpson (the engineer) says she never steamed so well before. We are adopting this style of netting for all the extension fronts where we have any changes to make. So far, we have found that all of them steam better than with the double nozzles and deflector. None of our ten-wheel engines are free steamers with our coal, but those we have tried with the single low nozzle have done better. Our ten-wheel engines have given very satisfactory service. After looking over our March report the other day to see how they compared with our eight-wheelers, I was able to make a statement to Mr. Ives (president) of the possible economy from the use of ten-wheelers as compared with the eight-wheel engines, based on the data obtained in operating. Had the freight-car mileage of the month been performed wholly by ten-wheel engines, the saving over the use of our eight-wheel engines would have exceeded $10,000. This is the saving of engine-men, train-men, and oil and repairs for the month, to say nothing of less shop room that would have been necessary, and the saving in the wages of wipers and other helpers.

Rock Island Locomotives.

Mr. Twombly, General Master Mechanic of the Chicago, Rock Island & Pacific road, has recently finished building a lot of seven new eight-wheel passenger locomotives that have been designed specially for the fast passenger service of the road. The boilers are straight, and have a diameter of 54 inches. The fire-box is 60 inches long and the tubes are 11 feet 4 inches long, there being 164 of them in the boiler, the outside diameter being 2 inches. The shell of the boiler is that well abused but reliable material, mild steel, $\frac{7}{16}$ inch thick. The outside shell of the fire-box and the flue sheets are ½ inch steel and the other inside sheets are $\frac{5}{16}$ inch thick. The dome is placed on the cylindrical part of the boiler to admit of the crown-sheet of the fire-box being stayed direct to the outside shell. The crown-sheet is arched, and makes a very strong box when put together in this way. The cylinders are 17 × 24 inches, and the drivers are 66 inches diameter, which gives about 105 pounds of tractive power for every pound of pressure exerted on the pistons. These engines have ports 15 inches long, which is a material increase in size over the ports of the locomotives usually built by Mr. Twombly. The engines are said to be very free steamers. We examined some indicator diagrams taken from one of them by Mr. Foster, chief draughtsman, and the distribution of steam was remarkably good. The speed at which the cards were taken varied from five to sixty miles per hour. At the latter speed there was little back pressure, and no more compression than was necessary to cushion the reciprocating parts and raise the pressure in the clearance space to boiler pressure.

In the Chicago round-house, which is a model of cleanliness and order, reflecting the greatest credit upon the foreman, E. W. Kenyon, they have a hydraulic drop traveling-jack in use for removing truck wheels, similar to that illustrated in the CAR-BUILDER of July, but smaller.

A Local Reporter Seeking Information.

A reporter of the New York *Sun*, who went to the Meadow shops of the Pennsylvania Railroad to collect material for an article on "Locomotives in Hospital," appears to have met with a wag who loaded him with some extraordinary information about railroad mechanical matters. He proceeds to tell the readers of that paper "that many of the locomotives are now in the shops receiving a sloping fire-box instead of the old-fashioned flat surface. The new style of box rests upon the frame of the engine, allows *eight inches* more of heating space and *lessens* the chances of spreading the wheels by close proximity to the fire-box." That is to us a new source of danger, for we never before heard that the fire-box transmitted heat sufficient to the axles to make them stretch so much as to be a source of danger. Perhaps it is from this cause that the engines the reporter saw are so hard on repairs. He asks the mentor, "one of the head mechanics," who is stuffing him:

> "How often is an engine in need of repairs?"
>
> "That is dependent as much upon the engineer as upon the engine itself. For instance, some engineers handle an engine very carefully and easily, while others pound them to pieces in quick order. The fast express engines suffer the most. The wear and tear upon them is beyond the comprehension of the ordinary passenger. For instance, an engine is sent to the shop for slight repairs; say her tire has worn down. Very often that will lead to the readjustment of her motion work, and a thorough renovation of all her parts follows. We ought to get 50,000 or 60,000 miles out of an engine before she requires complete overhauling. There have been exceptions, where a locomotive has run 70,000 miles without the need of a single repair beyond the kind that the engineer himself can attend to; on the other hand, some have been returned here with a record of only 40,000 miles."
>
> "How do you account for the discrepancy?"
>
> "It runs in the metal altogether. One piece of steel will not yield to dynamite. Another will succumb to a pressure of fifty pounds to the square inch. Science, experience and brains have not as yet been able to overcome the metal while it is in this fickle and capricious condition, or to explain why it is so."

This capricious conduct of the steel used by the Pennsylvania Company ought to be looked into. We used to think the machinery of the road was particularly free from accidents, but if they have got to using steel that yields, even on extraordinary occasions, to a pressure of fifty pounds to the inch, we may expect to see numerous break-downs soon on the fast trains.

Repairing Worn-Out Locomotives.

To the Editor of the National Car-Builder:

In your July number you mention with apparent approval a case of locomotive repairs in a Boston shop, where an old engine that has been in use more than a quarter of a century is undergoing a complete rebuilding, getting new boiler, new wheels and all attachments. Now, if you investigate that matter carefully, I think you will have reason to conclude that the operation of repairing that engine is a very unwise transaction. It is like repairing the one-horse shay. With good, new locomotives on the market for sale at actual cost, as there are many to-day, it seems very short-sighted policy to put great expense on rebuilding an old engine, which, at best, is old after all the expense is put upon her. If a closer record of the expense of doing work in repair shops prevailed, I feel certain that less patching-up of old machinery would be tolerated. A new, heavy American locomotive, first-class in every respect, may now be bought under $6,000, and the work on it will be made on interchangeable sizes, which, on well-regulated roads, is found a daily saving in the cost of repairs.

The engine your article refers to was not built in that way. It was fitted part by part, and the probability is that when the engine gets ready for pulling trains it will have cost the company more money than they would have spent in buying a good new engine. There is a certain nameless region said to be paved with good intentions. The good intentions of some master mechanics in regard to saving worn-out articles is often very expensive to the companies they wish to serve, and many railroad companies have good reason to desire to be preserved from the economical tendencies of their officers. A judiciously filled scrap heap is better than a gold mine to many railroad companies, and there never was a better time than the present for sending worn-out machinery there, when it can be replaced by good new articles at unprecedentedly low prices.

This Boston engine is no unusual case of over-zeal to repair worn-out locomotives. In nearly every shop in New England the same thing is going on, and I am told that the same tendency prevails in many other localities. One thing that I admire about the Pennsylvania Railroad Company's methods of carrying on their machinery department is their readiness to accept the fiat of time, and send an article to the scrap heap when it is worn out. The tendency in the last ten years has been to rapidly increase the weight of locomotives, so that to-day engines more than fifteen years old are too light for ordinary service. It would seem to be the course of wisdom to replace an engine with something more appropriate when she gets too light for the ordinary run of work. So soon as an engine is considered good merely for light work, it is certainly a foolish outlay to put heavy rebuilding expenses upon her. Yet this kind of work is going on all over the country, or I am badly misinformed. NEW ENGLAND.

THE Lancashire & Yorkshire Railway Co., of England, have lighted their trains between Leeds, Manchester and Liverpool with the electric light, there being in both the engine and guard's van a store of electricity sufficient to last six or seven hours. The engine for generating purposes is connected with the first compartment, and each subsequent coach with its fellow by means of slip catches, easily connected or disconnected by hand or by the breaking away of the train, and each coach is fitted with a cumulative battery. This system of batteries, charged before the starting of the train, permits of the division of the train without the light being impeded, the storage being sufficiently ample to last for the full journey should the engine with its generating power be taken away. An apparatus for turning the electricity on or off is under the control of the guard of each part of the train.

COL. EZRA MILLER, widely known as the inventor of the Miller Platform and Buffer, died at his residence in Mahwah, N. J., July 9, aged 73. He had been in declining health for some time, and was at the time of his death State Senator from Bergen County. In railroad annals his name has long been a familiar one and will not soon be forgotten. The life-saving invention which he perfected some twenty years ago, and with which his name will continue to be identified, is one of the most important improvements ever made in car construction. This is attested by its almost universal adoption, and the probability that it will not soon give place to anything better. He was the inventor of several other useful appliances, but his royalties on the "Platform and Buffer" alone made him very wealthy. Although in serving the public he enriched himself, the great number of lives his invention has been instrumental in saving is his best monument, and will cause his memory to be cherished as a man who has not lived in vain.

THE Boston & Albany Railroad Co. are reported to be experimenting with the use of coke in one of their passenger locomotives, as a remedy for the dust and smoke which they find inseparable from the use of soft coal. We predict that coke, as locomotive fuel, will prove a failure. Not but what it can be used for steam making without difficulty, but because its use offers no advantage not gained by the use of hard coal. Coke was used exclusively as fuel on British locomotives for the first twenty years of the railway era, and it was abandoned owing to the heavy expense its use entailed, and because the locomotives could be run burning soft coal without causing more discomfort to passengers than coke burning engines produced. Smoke consuming fire-boxes were invariably used when soft coal was burned. We believe that with some of the smoke consuming fire-boxes in use in this country in combination with the extension front, no more trouble will be experienced from cinders, dust and smoke when soft coal is burned, than there will be with coke.

BY a private letter from Huntington, W. Va., we learn that Mr. W. H. Thomas, Master Mechanic of the Chesapeake & Ohio Railroad, has been unusually successful in running locomotives with the extension front and single nozzle. He is said to be using 4¼ inch nozzle on 16 × 24 inch cylinder engines; 4½ inch nozzle with 17 × 24 inch cylinder engines; and 5 and 5¼ inch nozzles with 20 × 24 inch cylinders. Our informant says the engines steam very well with these large nozzles, and the exhaust is so soft that very few cinders are carried through the flues to the smoke-box, and the sparks that reach the smoke-box remain there, for the exhaust is too light to lift them up through the netting to the stack. There are freight engines doing work with a consumption of from 2 to 2½ pounds of coal per car-mile, and passenger engines are doing their work with from 3 to 5 pounds of coal per car-mile, those using the larger quantity hauling only 3 or 4 coaches. This we consider a remarkably good record, and which will compare favorably with any locomotive work ever done.

NATIONAL CAR BUILDER

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EDITORIAL ANNOUNCEMENTS.

Addresses.—*Business letters should be addressed, and drafts and money orders made payable, to* THE NATIONAL CAR-BUILDER. *Communications for the attention of the Editor should be addressed* EDITOR NATIONAL CAR-BUILDER.

Advertisements.—*Nothing will be inserted in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *The editorial department will contain our own views and opinions; and the rest of the reading matter, aside from advertisements, will be such as we consider of interest to our readers.*

Contributions.—*Articles relating to railway rolling stock, construction and management, and kindred topics, by those who are practically acquainted with these subjects, are especially desired. Also early notices of changes in railroad officers, organizations and names of companies.*

Our Western Office.

Our readers are informed that THE NATIONAL CAR-BUILDER has opened an office in Chicago, at Room 24, Adams Express Building, Dearborn street, where Mr. Angus Sinclair is in charge. Our friends residing in Chicago, or who may happen to be in that city, are cordially invited to call.

ECONOMY OF HEAVY LOCOMOTIVES.

In the communication from Mr. R. W. Bushnell, which we publish in another page, under the caption "Cedar Rapids Shop Notes," valuable testimony is given as to the economy of using ten-wheel instead of eight-wheel locomotives in railroad operating. Up till two years ago, the Burlington, Cedar Rapids & Northern Railway was operated exclusively by eight-wheel locomotives. The road is undulating, and most of the divisions have grades as steep as 60 feet to the mile, so that eight-wheel locomotives, weighing about thirty-five tons, with cylinders 17 × 24 inches, seldom took more than eighteen cars for a full train. As the business of the road was steadily increasing, it was decided two years ago to try ten-wheel engines for freight traffic. The engines selected were about ten tons heavier than the eight-wheelers, and they had one inch more diameter of cylinder, with sufficient boiler capacity to supply the increased demand for steam. These engines did their work with a trifling increase in expense of fuel and repairs, but they hauled from 20 to 35 per cent. more cars than the eight-wheelers could take over the grades. On an average, three of the large engines would take as many cars as four of the small ones. The saving of one train crew out of four represented an important reduction in operating expenses, but in many cases the saving of wages was of far less consequence than the acceleration of business that resulted from having 25 per cent. fewer freight trains on the road. When a single-track road is doing a heavy traffic that taxes every facility for moving cars, unavoidable delays are constantly occurring at the numerous meeting points. An improvement in the motive power that enables a given volume of business to be moved by fewer trains reduces the liability of this delay, and practically increases the capacity of the road. There is a limit to the length of trains, beyond which they may be so unwieldy as to cause constant danger from breaking in two, besides leading to the straining and wrenching of the cars from the shocks of starting and stopping, but that objection does not arise till more than thirty eight-wheel cars are on the train.

The objection generally raised on Western roads to increasing the weight of locomotives is the belief that they are hard upon the track and expensive to keep running. In most of cases this objection rests on a fallacy. A locomotive with three or four pairs of drivers puts less weight per wheel on the rail than an ordinary eight-wheel engine. There may be cases where the track and bridges are in such condition that increasing the weight of engines would be dangerous and expensive; but the railroads that are in this condition are happily becoming rare. The race of competition is now so exacting that the only means of carrying freight at a profit is by doing the work with the least possible expense. Using locomotives that will pull heavy trains is a direct move toward economical operating. The figures given by Mr. Bushnell do not, by any means, cover all the saving due to the use of ten-wheel engines. He make no account of the great wear to tires and track that results from the use of the average eight-wheel engine, which in bad weather slips incessantly on every hard pull when the drivers act like milling cutters on the head of the rail. In addition to destroying tires and rails, slipping tears up the fire, throwing away fuel, and it racks every part of the engine's mechanism, leading to the necessity for premature repairs. The proper way to avoid the expense resulting from the use of slippery engines, is to employ locomotives with sufficient adhesion; and well-designed engines with six or eight wheels coupled, have been found most successful in meeting this requirement. If properly designed, a ten-wheel engine is greatly superior to an eight-wheel locomotive for handling freight trains, but we consider the ten-wheeler a compromise inferior in every respect to the Mogul. What is urgently wanted in an engine for freight is sufficient adhesion, with good steaming capacity and ample cylinder power. It seems to us that every pound put upon a four-wheel truck, in addition to what would be necessary for a pony truck, is taking that much weight away from the drivers without any end being gained. When radial trucks came out first there was more or less trouble with engines that were designed with improper length of radial bar, and that spread abroad the impression that the pony truck was a dangerous device. This old objection has made many master mechanics conservative about using the Mogul engine, even in cases where it would be infinitely superior to any other form of engine for doing their work economically.

HANDLING HEAVY FREIGHT WITH CRANES.

One of the first things that strikes a foreigner visiting American railroads and machine shops is the multitude of apparently trifling operations to which power is applied for the purpose of saving manual labor. The comparatively high cost of labor throughout the United States has led to the substitution of machinery in almost every conceivable position where it would dispense with the work of human hands. In one particular we are, however, away behind our European neighbors, namely, in our methods of handling heavy goods. In handling grain and light articles, our facilities are unequaled; but when we require to move articles that run into tons weight, it seems natural to fall back upon crude backwoods methods. There are as good cranes made in American workshops as are produced anywhere, but the demand for them is ridiculously limited even for establishments that are daily losing money by their tedious methods of moving heavy material. The ordinary American railroad station and freight house compare very unfavorably with those in Europe in regard to conveniences for handling heavy freight. On the other side of the Atlantic, nearly every roadside station has a crane that will raise two or three tons weight, and it is regarded as a necessity at every station where freight is unloaded. When a car comes in loaded with a heavy casting or piece of machinery, it is switched to the crane and the heavy article lifted off without delay. At an American station, on the other hand, a crane is rarely found, and heavy weights are transferred from cars to wagons by the manipulation of wedges, levers and rollers, supplemented by liberal expenditure of physical force. The operation causes continual delay to cars and frequent damage. The work of a whole yard is frequently suspended while heavy weights are being moved off a car; and the service of cars is often lost for days, waiting for a time to unload the material when the operation will not stop very much work in the yard. Railroad companies and their patrons will all derive substantial benefit from the change, when the day comes that a good crane will be provided at every railroad station.

TRUCKS OUT OF SQUARE.

One of the most common causes of the unequal wear of wheels tending to produce sharp flanges, is admitted to be the distortion of the truck, or the truck being out of square, as it is called. Trucks are out of square in the building of them, they also become so by accident, and in other cases they are practically out of square when the wheels are not true to gauge and unequally pressed on the axles. On some roads it is the exception rather than the rule to find a truck with axles parallel and the wheels in correct tram. This can be demonstrated by a sliding gauge made to fit between the flanges. The parts of the gauge should slide on each other, so that variations of three or four inches can be read at the center where the parts lap. If the inside of the flanges are measured in this way the wide variations that will be found will be quite surprising, and on some roads it will be difficult to find a truck with two pairs of wheels of precisely the same gauge. Correct gauge measured from the treads is more common, but this does not by any means insure the correct position of the wheels on the axles, nor the parallelism of the axles. One wheel may be pressed on too far and another not far enough. This balances the errors, but does not prevent the truck from running cornerwise on the track. As trucks are usually built, it is a wonder that any of them are square. It is generally presupposed that the wheels are placed correctly on the axles, and that the castings for jaws and boxes do not vary from the patterns. The builder thinks the wheels that go into service are all right because they are all gauged after being fitted, and those that are over or under are thrown out. This is well enough as far as it goes, but it is not strictly mechanical.

That all sorts of common castings vary in size is well known. To suppose that journal boxes, wedges and pedestals are exempt from such variation is not reasonable. Taking castings as they run, it is an easy thing to set up a truck so the journals will be ¾ inch out of square, and yet follow the ordinary method of squaring the truck frame, bolting on the pedestals, putting in the boxes, etc. On some of the leading roads, both passenger and freight trucks depend for their accuracy upon the castings alone. The center of the pedestal is found, or rather the point where the center should be, and then it is bolted in place, the truck is declared correct and the wheels in tram. To this happy-go-lucky plan a very large percentage of train resistance may be traced. It may be that the extra friction of a six-wheel truck could be traced to this source. Many car-builders are already aware of this, but the great majority apparently are not. The first step in devising a remedy is to understand the nature of the evil and the extent of it. The difficulty in using any kind of gauge to ascertain whether a truck is square, is no doubt one of the reasons why attention has not sooner been called to the matter. To make a demonstration, the wheels must be gauged with relation to the journal, so that it may be certain that the tread of the wheel is at the exact distance from the center of the journal. When this is ascertained, one cause of the difficulty will be removed. Then a tram can be used, which, resting diagonally on the journals, will show whether they are square. A tram which would measure from the center-mark of one journal to that of the other diagonally opposite, would be very useful, because it could be applied to trucks already in use, and would tell at once how much the axles are out of line.

The remedies, which should begin in construction, are numerous. One method begins with the wheels. These are placed in chocks on the building track after they have been gauged, to see that they are in exactly the proper relation to the journal. Then the brasses are put upon the journals, the wedges over them, and the boxes slipped on. The pedestals follow and are blocked up to the proper height. The timbers are then put in place and marked in such a way that they may be gauged to see that in screwing up the bolts nothing is thrown out of line. This method secures the parallelism of the axles, makes it certain that the wheels will tram correctly, and gives a truck that is perfectly square. It appears from some imperfect experiments, that trucks built in this way haul from five to six per cent easier than those put up in the ordinary hap-hazard way. Another method is to apply the trams to the journals after the truck is built, and then correct any errors that may be found. This is somewhat inconvenient, because no easily applied tram or gauge has yet been suggested for the purpose. A reform in this matter would be of great benefit, incidentally, in reducing wear and tear caused by trucks out of gauge and having flanges too thick to pass guard-rails safely. On most lines it is easy to find in every train numerous flanges which only pass standard guard-rails by springing the rail.

INJUDICIOUS REPAIRING.

A correspondent, writing in another column on "Repairing Worn-Out Locomotives," draws attention to a practice common on many roads, that is followed in the interests of economy, and yet is really very expensive. As hard times in ordinary domestic economy leads to the renovating and patching up of old garments to defer the necessity for buying new ones, so it is natural for men in charge of railroad machinery to make repairs take the place of renewals at times when the earnings of the road are restricted. This propensity, while wise in its origin, is frequently carried beyond prudent limits, and then it becomes a source of waste. Having the capability of perceiving the point when it no longer pays to repair machinery, is a somewhat rare attribute, but there is no form of ability that pays better to railroad companies or machine-shop owners. There is a class of machine men who can never consent to send an intact article to the scrap heap, till years of repose in some place where it lay as obstructive litter, demonstrated beyond peradventure that it could never be used again. Engine

90 gets a new set of axle boxes, but two of the old ones are in pretty fair condition, and they are laid away carefully under a vise bench to be handy for some other engine of the same class that may come in with a broken box. A discarded eccentric strap taken off 187, and not more than a ½ inch out of round, is laid to repose in the vicinity of the axle boxes, and the adjacent space is filled with discarded feed pies, infirm pumps and their fittings, old stack cones, nozzle tips, an odd rod strap, several half-worn piston rings, a cylinder head with a short crack in it, a few brake-heads, a sand-box cover, and the inevitable oil-box cellar, besides a mass of promiscuous litter, all too good to throw away. A shop run under the influence of this kind of saving sentiment is usually a museum of worn-out articles, every recess and corner being filled with material that long ago ought to have passed through the rejuvenating power of the cupola or the forge. Good money has been paid out for tons of pig and bar-iron, whose place ought to have been taken by the scrap stowed away under the pretense of being available stock. Stuff of this kind is never available when wanted, and its individuality is only seen at the annual resurrection caused by stock-taking. A predilection for preserving half-worn articles is an inconvenient and expensive habit, but a fondness for keeping articles whose pattern has been changed is infinitely worse. In this case, casting-houses and store-rooms are littered with articles kept on hand because they have not been used and never will be. A vague hope is entertained that rough castings and forgings of this character may come in handy for some purpose, but successive annual stock-takings pass, and they all remain on hand, showing apparent plenty at times, in the presence of real scarcity. When the pattern room is critically examined, what a charnel house of obsolete practice it presents to the eye! Cylinders, patterns that have not been used in a dozen years, oil boxes that this generation has not seen in use, pumps whose design only old men are familiar with, and hundreds of details whose purpose the old pattern-maker scarcely remembers, are still preserved because the patterns have not rotted out. And all this time the pattern house is so badly overcrowded that searching for a pattern not in regular use entails hours of diligent labor.

This predilection for preventing the scrap heap from receiving its honest due is not confined to small parts of machinery. After many years it was finally decided to get a new planer in place of the old large one that had toiled in decrepitude long after truth and usefulness had departed from its operations. The new planer was placed where the old one had stood for a time beyond the memory of the oldest inhabitant, but was the old planer broken up? Not much. It was moved to the corner of the shop for the purpose of being used for odd jobs, and it is continually in the way, and the work done on it needs so much hand finishing that the jobs cost double what they are worth. The twelve-inch lathe that got too shaky for turning, was transformed into a bolt cutter, in which capacity it does not prove a shining success, since the work cost half as much as a new machine could have been got for, and the tool will never do half the work done by a good bolt cutter.

Mistakes made in respect to the persistent holding on to obsolete and unsuitable tools, are scarcely so serious in their consequences as holding on to locomotives that have become unsuitable for the service of the road. Worn-out engines are hard to sell to advantage, and many roads cannot afford to cut up good locomotives because they have become too light; but on the other hand no extensive repairs should be expended on engines that have outrun their usefulness. When engines that have become too light for any but special service on a road, require new boilers and cylinders, it would in nearly all cases be the course of wisdom to cut them up. The roads that follow this practice are those that are in the most flourishing condition. The same principle applies to the repair of cars. The fact should not be overlooked that, however thoroughly a locomotive or car may be overhauled, and whatever amount of money may be expended in making it nearly as good as new, it is still old, and its market value is, to some extent, regulated by its age.

CONSIDERING the trifling mileage of new railroad track that has been laid this year, the rail mills throughout the country have been kept well supplied with orders. The demand for steel rails has come mostly from old roads for relaying of track that wore out much more rapidly than was anticipated when steel rails were first laid down. Very few roads are now laying down steel under 60 pounds weight to the yard, and 65 pounds is a very common size. A decided mistake was made on many roads by laying down the first steel too light, and in some quarters this has proved a very expensive mistake. A gentleman who has unusually good opportunities for finding out the condition of railroad track throughout the country, recently informed the writer that the rails on many first class roads are getting in seriously bad condition, and that the first revival in railroad earnings is likely to bring about extensive renewals of steel rails. Although steel rails have not gone to pieces under heavy wear by laminating, as iron rails used to do, the ends have flattened down badly; and since the rails have got weakened by wear, there have been so many breakages under the increasing loads, that a change to a heavier rail is on many roads deemed urgent.

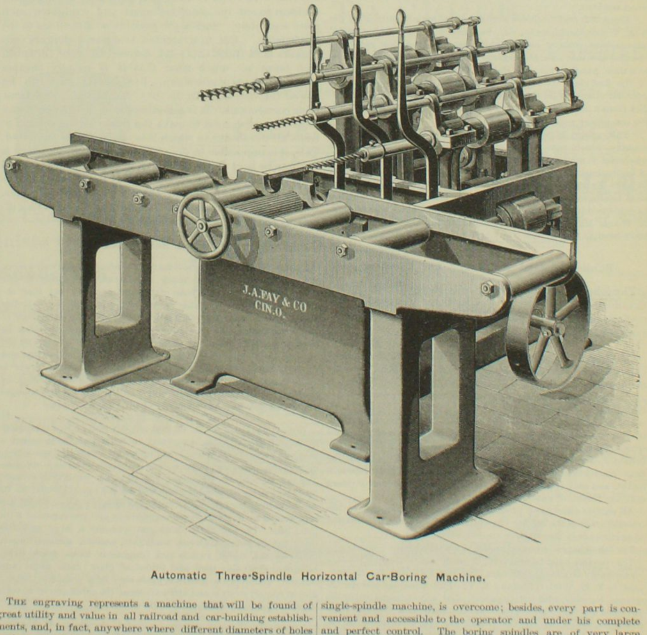
WE can not keep the run of all the projects for propelling cars by electricity that have been announced within the last twelve months. The results, however, are strikingly uniform up to this present writing. The cars are not propelled at all, except on paper. Whether this is owing to unlooked for mechanical defects in the methods of utilizing the electrical energy, or to the rival claims of patentees, we are unable to say. It would certainly be less tantilizing if the announcements were withheld from the public until "the novel sight of cars running without any apparent propelling force, and free from the annoyance of dust, smoke and noise," had been actually realized. What has made the name of Keely a by-word and derision is not so much the failure of his etheric-intermolecular vaporizing machine, as the premature announcements of its success. Not that we would class electric motors for cars with Keely's nondescript, for there is no question as to the running of cars by means of electric currents generated by dynamos. The only question is as to its economy and effectiveness in superseding horses and steam motors on surface and elevated street lines. Anything short of this will not be a success, but a failure. Does anybody suppose that fifty years from now dilapidated horses will be pulling cars through the streets just as they are to-day? Hardly. Then hurry up the mechanical motors, gentlemen—electric, pneumatic, grip-cable or what not, and let horse-flesh take a vacation.

THE Lake Shore & Michigan Southern Railway Co. have determined to subject all new men taken on for locomotive, train and telegraph service to tests for color blindness and vision power similar to those in use by the Pennsylvania Railroad. In the course of a conversation with Superintendent Amsden, of the Chicago Division, we learned that there is no intention to subject old employés to color-blind tests, unless a case occurs where there is reason to believe that a man is suffering from defect of vision. The system to be introduced is very simple, and consists principally of matching four or five strips of colored yarn. No naming of the colors is required, but merely putting pairs of the same shade together. There is nothing puzzling about the operation to men who are able to distinguish colors, and those who cannot do that have no right to be employed in the operating of trains where they are required to watch signals.

SEVERAL Western railroads have adopted a method, the first, so far as we are aware, used by James Meehan, of the Cincinnati, New Orleans & Texas Pacific road, for saving the heat of an engine that has to be cooled down and transferring it to the boilers of those getting ready for the road. The heating pipes in the round-house are in most instances used to perform the operation, but in some cases special piping is put in for the purpose. When an engine comes in with steam on that can be spared, a blow-off cock is connected with the round-house piping and by that means the steam is forced into the boilers of engines that are getting up steam. Provision is also made for operating the blower of a cold engine with the steam taken from the boiler being cooled down. When an engine is wanted in a hurry this plan greatly facilitates the raising of steam. Pipe fittings are cheap, and we do not see why this plan should not be adopted in every round-house equipped with heating pipes. Where it is not desirable to heat up the coils, they can easily be cut off.

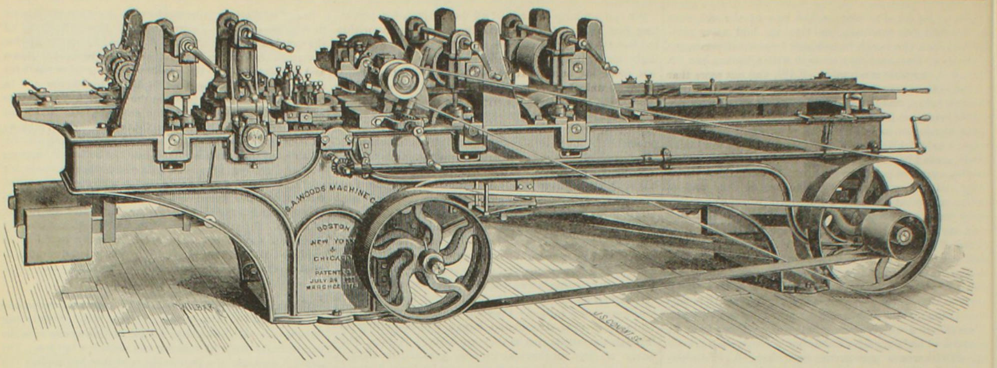
THERE is a decided movement in progress among the Western and Northwestern railroads, in favor of equipping freight cars with automatic brakes as fast as the expense can be borne without making the outlay a burden. The general manager of a prominent road that has applied the automatic brake to a considerable number of freight cars, assured the writer lately that the company is better pleased with the operating of freight trains equipped with continuous brakes, than they expected to be when the experiment was first tried, and that he anticipates, within a few years, seeing a continuous brake regarded as much of a necessity on a freight car as it is now deemed an essential part of a passenger car.

WE recently learned from the coal and fuel agent of the Chesapeake & Ohio Railroad, that his company are carrying coal 370 miles for one dollar per ton. They find that when coal has to go West the owners prefer it to be loaded in box or stock cars, as there is considerable less shrinkage when these cars are employed. The colored gentlemen by the wayside, however, apply cuss words to the mean white folks who go and put the coal in other than open flat cars. They like to aid the process of evaporation which the coal passes through in open flats.



Automatic Three-Spindle Horizontal Car-Boring Machine.

THE engraving represents a machine that will be found of great utility and value in all railroad and car-building establishments, and, in fact, anywhere where different diameters of holes in the same piece of material are required to be made. This tool is from the well-known wood-working establishment of J. A. Fay & Co., Cincinnati, O. It is an ingenious arrangement of appliances to produce certain results, which no machine has heretofore, to our knowledge, accomplished. The frame of the machine is massive and heavy, and every part of the most substantial construction in view of the work it is expected to perform. It carries three boring spindles, each having a quick automatic independent vertical adjustment. By moving the hand-levers forward or back, either of the boring spindles can be raised or lowered to any desired height, independent of the other. By the use of three spindles, the avoidance of frequently changing augers, as in the single-spindle machine, is overcome; besides, every part is convenient and accessible to the operator and under his complete and perfect control. The boring spindles are of very large diameter, with heavy bearings and long quill; each has a traverse movement of 16 inches, and will bore through 14-inch timber. Stop-collars are provided for determining the length of the boring. The carriage, in which the boring spindles run, moves up and down in planed ways by means of square thread-screws, actuated by friction gearing. The table or platen is 7½ feet long, massive and heavy, and provided with friction rollers for the timber to rest upon, also a fluted roller and hand-wheel for aiding and moving the material quickly to a determinate point for boring. The countershaft is placed above the machine, but one belt being required to convey the power of all three boring spindles.



FAST-FEED FLOORING MACHINE.

THE following description of this machine has been furnished by the designers, the S. A. Woods Machine Co., and also a statement of the exhibits of this company at the New Orleans Exposition :

"One of the most important and widely-used machines in the exhibit referred to above, is the new heavy pattern flooring machine, an illustration of which we present with this article. This machine has been designed by the S. A. Woods Machine Co. with special reference to high speed and fast feed, to meet the requirements of mills doing a large amount of business, and at the same time producing the very best work. It embodies many new features, and every part is proportioned with special reference to convenience and durability. One of the special features of this machine is the feed rolls, which are heavily weighted and provided with expansion gears, and are so mounted with expansion gears upon both ends of the shafts that an equal pressure is obtained on both edges of the board, causing it always to "hug the guide" and feed through straight.

"The method of suspending and weighting the feed rolls is entirely new, and the machine possesses many valuable and novel features which can not fail to make it popular with practical wood-workers.

"Eight different machines were exhibited for competition by the S. A. Woods Machine Co., viz., Fast-feed flooring machine, molding machine, planing and matching machine, jointing machine, circular saw machine, planing machine for matching two boards at a time, panel planer, and shop surfacer, and eight gold medals of the first class for superior excellence were received by them over all competitors, thus placing their machines, on a fair verdict from a committee of experts, at the head of the wood-working machinery manufacture of the world.

"This award is well deserved, for there is no concern in the country which pays closer attention to the manufacture of its machines, or maintains a position nearer to the front in the matter of improvements. The verdict of the judges of award at the New Orleans Exposition is one which had already been made by the most intelligent wood-working firms in this and other countries, as evidenced by the large orders for their machines which the S. A. Woods Machine Co. have received during the Exposition and since its close."

Public Trial of Automatic Car Couplers

The following circular has been issued by the Executive Committee of the Master Car-Builders' Association, appointing a time and place for a public trial of automatic car couplers :

NEW YORK, July 25, 1885.

The Executive Committee of the Master Car-Builders' Association, acting in accordance with the general instructions given by the Association at the last Convention, will make a public trial of automatic freight car couplers at Buffalo, N. Y., on Tuesday, September 15, 1885.

The Executive Committee will be guided by the results of their trial in recommending several forms of couplers to the railroad companies for further test in actual service. They will watch the behavior of those selected couplers until one month prior to the next convention of the Association, when they will prepare a report, and may recommend for universal adoption one or more different forms of automatic freight-car couplers.

All parties desirous of presenting freight car couplers to the consideration of the Master Car-Builders' Association are invited to participate in this trial.

The following requirements must be complied with :

The couplers must be attached to each end of two freight cars —preferably box cars; both cars must be forwarded, freight prepaid, to F. M. Wilder, Buffalo, N. Y. Full drawings and specifications, together with letters-patent, and any opinions on the device that may have been given by the Eastern or Western Railroad Association, or by the courts, and also a statement of the numbers and initials of cars equipped with the coupler and already in service, must be forwarded to the Executive Committee of the Master Car-Builders' Association, care of F. M. Wilder, Superintendent of Motive Power, New York, Lake Erie and Western Railroad, Buffalo, N. Y., prior to September 15.

The Committee will not consider or investigate the merits of couplers represented only by models, drawings or other descriptions. An imperative condition of the trial will be that couplers submitted to the Committee *must be applied to two cars* so that they can be tested at the time and place named.

The Executive Committee is not prepared to assist inventors or owners of patents on car couplers in procuring cars to be equipped and delivered at Buffalo ready for trial. Negotiations of this character must be conducted directly between the owners of the couplers and the railroad companies. It will also be necessary for parties furnishing cars for this trial to arrange direct with the railroad companies for their return.

Notice of intention to take part in the trial, giving the numbers and initials of the two cars that will be forwarded, should be addressed to Edwd. B. Wall, Columbus, Ohio, or to M. N. Forney, 73 Broadway, New York, who will also answer inquiries with reference to the proposed trials.

Railroad Commissioners of the various States will be invited to be present at this trial. By order of the Executive Committee.

M. N. FORNEY, Secretary.

Iron in Car Framing.

In designing and constructing iron framing for cars, it is a mistake to make the corners or connections continuous, and the same is true with respect to the frames of trucks and locomotives If the parts of a car body are put together with rivets or bolts, it is quite easy in case of an accident to cut the members apart and straighten each piece separately. Such a job presents no difficulties to the blacksmith. But to straighten two pieces that are continuous and form a solid corner is very difficult, and takes so much time that it is usually cheaper to throw the parts into scrap. Bent sheets, even, can be passed through the rolls if they can be cut away from their connections. It is sometimes said that the best way to avoid such cases is to make the frame strong enough to resist all the shocks to which it is likely to be subjected. This, it is impossible to do. The frame of a locomotive is liable to be bent and even broken in violent collisions, and a car or truck frame cannot profitably be made equally as strong. The introduction of joints at suitable places, while it does not weaken the structure or diminish its stiffness, is a valuable aid in the making of repairs.

Improved Baker Heater.

This new heater contains several improvements on the well-known device which has given so much satisfaction and safety to car heating. The pipes have been rearranged in such a way that obstructions leading to choking up will not be possible. A valveless disk of rubber is used in place of a safety valve, the advantage of this being that it will not become inoperative from corrosion or require screwing down. A simple arrangement of a flange on top of the furnace cover, keeps the hot and cold air from mixing, and prevents the gas from passing into the car. The dump grate is made to turn clear down where necessary to facilitate cleaning the fire, and the ash-pan is made deeper. We believe the changes made will increase the popularity of this excellent heater.

WILLIAMS, PAGE & CO., of Boston, the well-known manufacturers and dealers in car lamps and car trimmings, have issued a new and superbly illustrated catalogue of their leading specialties, and also including an extensive line of general railway supplies. The volume contains 195 pages, 9 × 12 inches, exclusive of index, 52 of which are devoted to lamps and lamp trimmings, and 79 to car trimmings, embracing an extensive category, all of which are represented by finely executed engravings, and accompanied with price lists. The rest of the catalogue contains a large miscellaneous list, including lanterns, headlights, heaters, springs, forges, pulley-blocks, clocks, switch and freight-car locks, track tools, barrows, etc., also sizes and prices of glass, nuts, bolts and screws. Reference to details is made easy by a complete index ; and in respect to style and attractiveness, the catalogue is a very superior specimen of this class of publications.

LINCRUSTA-WALTON.—Some beautiful specimens of this material were exhibited by F. R. Beck & Co., of New York, at the recent annual meeting of the Master Car-Builders' Association, at Fortress Monroe, comprising a variety of new and tasteful designs adapted to the interior decoration of passenger cars. This firm are the only manufacturers of the material in the United States under the patents, and are constantly devising improvements which render it more beautiful, durable and effective in its application to interior embellishment.

THE AJAX METAL CO., Philadelphia, through its agents in London (Philip S. Justice & Co.) have contracted to supply several large corporations in England with their Ajax metal for one year at a stipulated price, and a guarantee in respect to saving as compared with the alloys used and tested by such corporations during the past three years. The aggregate sales of metal by the Ajax Co. will probably reach 175 or 200 tons during the current year.

THE ELEMENTS OF RAILROADING : By Charles Paine, formerly President of the American Society of Civil Engineers, more recently General Superintendent of the Lake Shore & Michigan Southern road ; General Manager of the New York, West Shore & Buffalo, and at present General Superintendent of the New York, Pennsylvania & Ohio. This volume contains 154 pages, and is made up of a series of short essays contributed by the author to the *Railroad Gazette* on the following subjects: Surveying and Construction ; Real Estate and Records ; Drainage ; Main Track ; Trackmen and Sidings ; Stations ; Shops and Engine Houses ; Telegraph Lines and Fences ; Locomotives ; Cars ; Movement of Freight and Passengers ; Employés. These subjects are concisely treated from the standpoint of large experience, and although many things are said which every capable railroad officer already knows, there is also much that is new and valuable as an addition to the mass of railroad literature. Published by the *Railroad Gazette*. Price $1.00.

THE Union Switch and Signal Co., Pittsburgh, have issued a new illustrated catalogue of Saxby & Farmer Interlocking, prepared by Mr. Chas. R. Johnson, the signal engineer of the company. It is a book of 100 pages, and contains illustrated descriptions of each part in detail of the interlocking mechanism, connections, signals, etc., also instructions to operators, lampmen and repairers. The company recommended that a copy of the work be left at every place on roads protected by their interlocking, or placed in the hands of the signal foreman for use in ordering any of the parts that may need repair.

Our Directory.

We note the following changes since our last issue. Our readers will do us a great favor by giving us prompt notice of any changes that may come to their knowledge or of any errors that may be noticed in our list:

Brunswick & Western.—John K. Nightengale has been appointed Purchasing Agent.

Chicago, Rock Island & Pacific.—E. St. John has been appointed Assistant to the General Manager.

Chicago & Alton.—Wm. Hill has been appointed Division Master Mechanic, at Slater, Mo.

Cleveland & Canton.—This is the name of the new company which is the successor of the Connotton Valley road.

Flint & Pere Marquette.—W. F. Potter, heretofore Superintendent of the Eastern Division, has been appointed Assistant Superintendent, with authority over the entire line and branches.

Hartford & Connecticut Western.—Edward McNeil has been appointed Superintendent of this road, in place of J. F. Jones resigned.

Indiana, Bloomington & Western.—E. Hiserodt has been appointed Master Mechanic, in place of B. Warren, resigned.

Mexican Central.—Edward W. Jackson has been appointed General Manager, in place of Daniel B. Robinson, resigned.

Missouri Pacific.—T. W. Newell has been appointed Master Mechanic of the shops at Sedalia, Mo.

New York, New Haven & Hartford.—Wm. A. Waterbury has been appointed Superintendent of the Shore Line and Air Line Divisions, vice O. M. Shepard, who has been appointed Assistant to the President.

New York, Pennsylvania & Ohio.—A. M. Tucker has been appointed Division Superintendent. He was recently on the Lake Shore road.

New York & New England.—W. H. Griggs, of Syracuse, N. Y., has been appointed Master Mechanic of this road.

St. Louis & Cairo.—E. J. Newell has been appointed Master Mechanic.

Toledo & Ohio Central.—This company is the successor of the Ohio Central.

Union Pacific.—J. H. McConnell, formerly in charge of the shops at North Platte, has been appointed Master Mechanic of the Nebraska Division.

Employment.

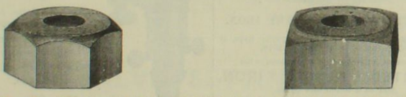
WANTED.—By a young man who has had large experience in railroad car shops as an accountant, and who is thoroughly familiar with the details and specifications of car work, a position in a railroad car shop or car manufacturing establishment. Can furnish the best references and recommendations. Address W. H., office of NATIONAL CAR-BUILDER.

The Sherwin-Williams Co.,
manuf's of
Finest Paints and Colors
for Railway use.
Offices, 100 Canal St, Cleveland and 24, Jackson St, Chicago.

Established 1856.
Shipman & Bolen, Mfrs. of fine
Railway Varnishes.
Our Varnishes excel in durability,
Newark, New Jersey.

BOUND VOLUMES
OF
The National Car-Builder
For 1880, 1881 and 1882.
Price, - - $3.00 each.

Rhode Island Tool Company,
MANUFACTURERS OF
COLD PUNCHED, SQUARE AND HEXAGON



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Small Forgings of all Kinds Made to Order.
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Wason Mfg. Co., of Springfield, Mass. | Portland Company, of Portland, Me.
RAILWAY CARS, ETC. | LOCOMOTIVES.
18 BROADWAY (Welles Build'ng), NEW YORK.

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PRIVACY, LUXURY, COMFORT. PERFECT VENTILATION.
Run regularly on express trains between
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NEW ORLEANS & ATLANTA.
Leave New Orleans 9:00 P. M. daily. | Leave Atlanta 1:30 P. M. daily.
CINCINNATI and JACKSONVILLE, Fla.
Leave Cincinnati 8:47 P. M. and 8:30 A. M. daily. | Leave Jacksonville 8:50 P. M. and 7:40 A. M. daily.
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REFINED MALLEABLE IRON CASTINGS
TO ORDER.
GENERAL RAILROAD AND CAR WORK A SPECIALTY.
Awarded Bronze Medal at National Exhibition of Railway Appliances, Chicago, 1883, for best Piece Malleable Iron Casting.
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PATENT PORTABLE CROSS-HEAD
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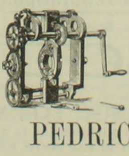

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Most Improved and Patented WOOD-WORKING MACHINERY,
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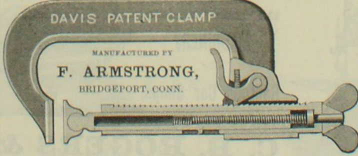

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The new Clamp represented in the above cut, on account of combining the qualities of quick adjustment and durability, recommends itself as the most practical tool of the kind ever offered in the market It has the especial advantage over all others in clamping the work without displacement, being so constructed that in operating the plunger or screw it does not turn as in all other clamps, but is forced directly on the work by the thumb-screw.

These clamps are made of the best malleable iron, and a trial of them will prove the justice of my claim for their being not only the cheapest and easiest working, but the only practical adjustable clamp made.

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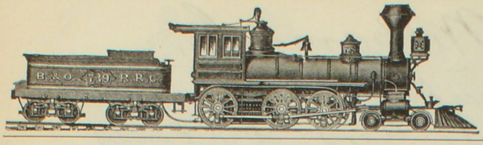

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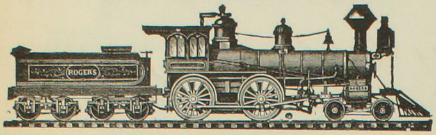

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R. S. HUGHES, Secretary. } PATERSON, N. J.
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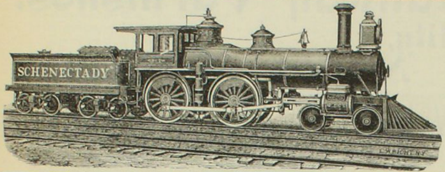
WILLIAM P. CHAPIN, Treasurer. JOSEPH LYTHGOE, Superintendent. WILLIAM H. FENNER, Jr., Agent.



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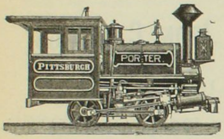

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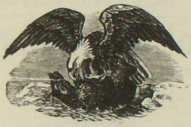

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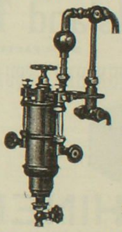

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Patent Approved by both the Eastern and Western Associations.

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We would call the attention of Master Mechanics and Master Car-Builders to our
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The Metal is for Sale Either in Ingot or Castings.
DAMASCUS BRONZE COMPANY, PITTSBURCH, PA.

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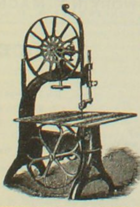

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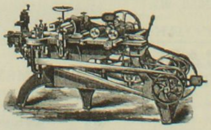

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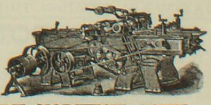

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Planers, Vertical Car Tenoners, Gaining, Tenoning, Rotary Mortising Machines.
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The questions given Firemen on an

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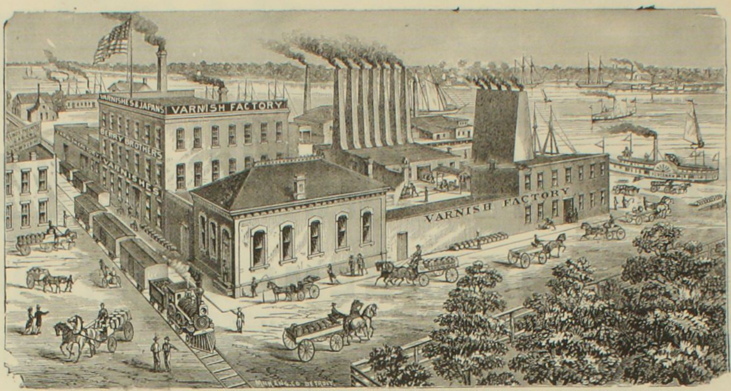

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FOR SALE—Twenty second-class 16 foot Street Railway Cars, 5 feet 2 inches gauge.

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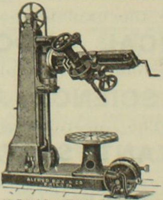
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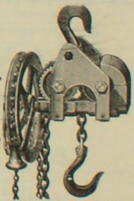

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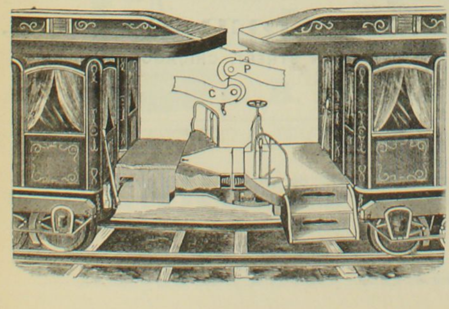

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The Coupler (like the buffer) works perfectly with the Miller, costs no more, and uncouples easily by the use of one lever only.

The Cowell Freight Coupler is a combined Hook and Link Coupler—automatic in both cases.

It may be seen on the Fitchburg R. R., N. Y. Central, Providence & Worcester, Mich. Central, Valley Ry., N. Y., N. H. & Hartford, etc.

The Passenger device is used on Flint & Pere Marquette, Western & Atlantic, Cincinnati, New Orleans & Texas Pacific, Newburgh, Dutchess & Conn., N. Y. Central, Mann Boudoir Cars and others having trial trains.

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THE COWELL PLATFORM AND COUPLING CO.,
CLEVELAND, O.

DIRECTORY

of the Railroads of the United States and Canada, showing the gauge, length of road, number of locomotives and number of cars; and giving the names and titles of their principal officers in charge of the operating, purchasing and rolling stock departments

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Jacob Myers, *M. M* .... Saratoga, N. Y.
Jas. J. Traver, *M. C. B* .... Saratoga, N. Y.
Addison & Northern Penn'a Ry. 3 g. 51 m. 5 lo. 50 c.
F. M. Baker, *Gen. Supt* .... Addison, N. Y.
Alabama Great So'n R. R. (*See Cin., N. O. & T. P.*)
Albany & Susquehanna R. R. (*See D. & H. Canal Co.*)
Albemarle & Raleigh R. R. 4-8½ g. 33 m. 3 lo. 35 c.
Jas. H. Petty, *Gen. Supt* .... Tarboro, N. C.
Albert Ry. 4-8½ g. 51 m. 3 lo. 35 cars.
G. A. Robinson, *Man. & Pur. Agt.* Hillsboro, N. B.
Jas. McKay, *M. M. & C. B* .... Hillsboro, N. B.
Alexandria & Fredericksburg Ry. } *See Penna. R. R.;*
Alexandria & Washington R. R. } (7) *Div.*
Allegheny Valley R. R. 4-9 g. 259 m. 70 lo. 2202 c.
David McCargo, *Gen. Supt. & Pur. Agt.*; and
C. B. Price, *Supt.* (Riv. Div.) .... Pittsburg, Pa.
A. A. Jackson, *Supt.* (L.G. Div.) Reynoldsville, Pa.
W. A. Wood, *M. M* .... Verona, Pa.
R. Gunning, *M. C. B* .... Verona, Pa.
Alliance, Niles & Ashtabula R. R. (*See Penna. Co.*)
Annapolis & Elk Ridge R. R. 4-8½ g. 20 m. 4 lo. 29 c.
W. H. Bians, *Supt. & Pur. Agt.* Annapolis, Md.
John L. Beall, *M. Mach* .... Annapolis, Md.
Anniston & Atlantic R. R. 3 g. 9 m.
Tho. K. Scott, *Supt.* .... Anniston, Ala.
Antwerp & Paulding R. R. 4-8½ g. 6 m. 4 lo. 63 c.
E. C. Munson, *Gen. Man* .... Antwerp, O.
William Fitzsimmons, Jr., *Pur. Agt.* Antwerp, O.
Arizona & New Mexico Ry. 3 g. 71 m. 3 l. 60 cars.
W. H. Jones, *Gen. Supt. & P. A.* Lordsburg, N. M.
W. C. Boylan, *M. M. & M C. B.* Lordsburg, N. M.
Arkansas Midland R. R. 3-6 g. 63 m. 4 lo. 45 cars.
A. H. Johnson, *Pr. & Gen. Man* ... Helena, Ark.
J. B. Johnson, *M. M. & M. C. B* ... Helena, Ark.
Arkansas & Louisiana Ry. 4-8½ g. 28 m.
J. D. Beardsley, *Supt* .... Washington, Ark.
Asheville & Spartanburg R. R. 5 g. 49 m. 2 lo. 12 c.
Jas. Anderson, *Supt. & Pur. Agt.* Spart'b'g, S. C.
M. M .... Spartanburg, S. C
Ashland Coal & Iron Ry. 4-8½ g. 22 m. 7 lo. 432 c.
Douglas Putnam, Jr., *Gen. Supt.* Ashland, Ky.
Robt. Peebles, *Pur. Agt* .... Ashland, Ky.
E. M. Roberts, *M. M* .... Ashland, Ky.
Ashtabula & Pittsburgh Ry. (*See Penna. Co.*)
Atchison, Topeka & Santa Fé R. R.
4-8½ g. 2,620 m. 348 lo. 9,629 cars.
A. A. Robinson, *Gen. Man* .... Topeka, Kan.
Geo. Hackney, *Supt. Mach* .... Topeka, Kan.
Clem. Hackney, *Asst. Sup. Mach. Dept.* do.
A. C. Armstrong, *Pur. Agt* .... Topeka, Kan.
Eastern Div.: D. J. Chase, *Supt.* ... Topeka, Kan.
Henry Hull, *G. F. Car Dept* .... Topeka, Kan.
John Fagan, *M. M* .... Atchison, Kan.
J. M. Smith, *M. M* .... Kansas City, Mo.
Alfred Taylor, *M. M* .... Emporia, Kan.
Mid. Div.: H. R. Nickerson, *Supt.* Nickerson, Kan.
W. Y. Johnson, *M. M* .... Nickerson, Kan.
W. Div.: C. M. Rathburn, *Supt* ..... La Junta, Col.
A. C. Stiles, *M. M* .... La Junta, Col.
D. H. Dotterer, *M M* .... Raton, N. M.
Las Vegas Div.: Chas. Dyer, *Supt.* Las Vegas, N. M.
F. B. Woodruff, *M. M* ..... Las Vegas, N. M.
J. H. Holman, *M. M* .... Wallace, N. M.
Rio Gr. Div.: P. F. Barr, *Supt.* San Marcial, N. M.
E. Hackett, *M. M* .... San Marcial, N. M.
H. P. Olcott, *M. M* .... Deming, N. M.
Geo. A. Hancock, *M. M* .... El Paso, Tex.
Sonora Div.: 265 m.
L. H. Waugh, *M. M* .... Guaymas, Mex.
Kan. Cy., Law. & So. Kan.
4-8½ g. 399 m. 24 lo. 787 c.
J. L. Barnes, *Supt* .... Lawrence, Kan.
T. D. Volk, *M. M* .... Ottawa, Kan.
Atlanta & West Point R. R. (*See Western of Ala.*)
Atlantic & Danville Ry. 3 g. 17 m.
E. G. Sweatt, *Gen. Man* .... Waverly, Va.
Atlantic & North Carolina R. R. (*See Midland; N. C.*)
Atlantic, Tenn. & Ohio R. R. (*See Rich. & Dan.;* (2) *Div.*)
Atlantic & Pacific R. R. 4-8½ g. 575 m.
F. W. Smith, *G. Supt* .... Albuquerque, N. M.
F. P. Wherry, *Pur. Agt* .... St. Louis, Mo.
Geo. Chalender, *Supt. M. P. & M.*, and
Geo. F Chalender, *A. Supt.* Albuquerque, N. M.
B. C. Bosworth, *M. M* .... Coolidge, N. M.
Augusta & Knoxville R. R. (*See Port Royal & Aug.*)
Austin & Northwestern R. R. 3 g. 60 m. 5 lo. 75 c.
J. A. Rhomberg, *Gen. Man* .... Austin, Tex.

B

Bachman Valley R. R. (*See Han. Junc., Han. & Gett.*)
Balt. & Delaware Bay R. R. 4-8½ g. 50 m. 2 lo. 13 c.
Fred Gerker, *Gen. M. & P. A.* Chestertown, Md.
Baltimore & Hanover R. R. (*See H. J., H. & G.*)
Baltimore & Ohio R. R.
4-8½ g. 1,612 m. 574 lo. 17,339 cars.
B. Dunham, *Gen. Man* .... Baltimore, Md.
N. S. Hill, *Pur. Agt* .... Baltimore, Md.
Main Stem Div.: 4-8½ g. 972 m.
W. M. Clements, *Gen. Supt* ... Baltimore, Md.
A. J. Cromwell, *M. of M* ..... Baltimore, Md.
E. W. Grieves, *M. C. B* ..... Baltimore, Md.
Andrew Beckett, *M. M* ..... Baltimore, Md.
Wm. Edwards, *M. M* ... Martinsburg, W. Va.
Sam. Houston, *M. M* ..... Piedmont, W. Va.
Robert Maxwell, *M. M* ..... Cumberland, Md.
W. P. Harris, *Supt. West of* Cumberland, Md.
S. B. Crawford, *M. M* ..... Grafton, W. Va.
Alex. Laird, *M. M* ..... Parkersburg, W. Va.
W. B. McClung, *M. M* ..... Wheeling, W. Va.
Pitts. Div.: H. P. Harris, *Supt* ..... Pittsburgh, Pa.
I. N. Kalbaugh, *M. of M* ..... Pittsburgh, Pa.
Trans-Ohio Divs.: G. J. Foreacre, *G. Supt.* Newark, O.
W. H. Harrison, *M. of Mach* ..... Newark, O.
E. L. Weisgerber, *M. M* ..... Newark, O.
H. M. Ingler, *M. M* ..... Bellaire, O.
O. B. Perkins, *M. M* ..... Zanesville, O.
Thos. Taylor, *M. M* ..... Sandusky, O.
F. J. Gunther, *M. M* ..... Chicago Junction, O.
Chi. Div.: F. H. Britton, *Supt. Trans* Chicago, Ill.
Benj. Lowther, *M. M* ..... Garrett, Ind.
W. H. Wilkinson, *M. M* ..... Kingston, Ill.
C. H. Campbell, *M. M* ..... So. Chicago, Ill
Newark & Straitsville Div.: N. Criswell, Shawnee, O.
Baltimore & Philadelphia. 4-8½ g. 40 m. 7 lo. 35 c.
B. Dunham, *Gen. Man* ..... Baltimore, Md.
Jas. McCreighton, *Supt* ..... Wilmington, Del.
Baltimore & Potomac R. R. (*See Penna. R. R.;* (7) *Div.*)
Bangor & Piscataquis R. R. 4-8½ g. 63 m. 4 lo. 87 cars.
Arthur Brown, *Supt. & Pur. Agt.* Bangor, Me.
C. S. Nason, *M. M* ..... Bangor, Me.
J. W. Comins, *M. C. B* ..... Oldtown, Me.
Bangor & Portland Ry. 4-8½ g. 25 m. 3 lo. 3 c.
C. Miller, *Pres. & Gen. Man* ... Blairstown, N. J.
Barclay R. R. 4-8½ g. 16 m. 6 l. 200 c.
F. F. Lyon, *Supt* ..... Barclay, Pa.
J. A. Hardenburg, *Pur. Agt.* 21 Cort. st., N. Y.
Wm. Johnson, *M. M* ..... Towanda, Pa.
Batesville & Brinkley R. R. 3 g. 40 m. 3 lo. 42 c.
R. W. Martin, *Pres* ..... Little Rock, Ark.
W. J. Thompson, *Gen. Man* .. Little Rock, Ark.
E. Summerfield, *Gen. Supt* ..... Brinkley, Ark.
John White, *M. M* ..... Brinkley, Ark.
Bath & Hammondsport R. R. 3 g. 10 m.
Allen Wood, *Gen. Man* .. Hammondsport, N. Y.
Baton Rouge, Grosse Tête & Opelousas R. R.
5-6 g. 29 m. 3 lo. 12 c.
D. C. Montan, *Gen. Supt* ..... Port Allen, La.
Bedford & Bloomfield Ry. 3 g. 43 m. 5 lo. 86 cars.
Jas. W. Kennedy, *Gen. Supt. & Pur. Agt.*; and
Capt. John Thumser, *M. M* ..... Bedford, Ind.
Jas. Richards, *M. C. B* ..... Bedford, Ind.
Bellaire, Zanesville & Cin. Ry. Co. 3 g. 112 m 5 lo. 71 c.
S. L. Mooney, *Pres* ..... Woodsfield, O.
W. R. Crumpton, *Gen. Man* ..... Zanesville, O.
C. E. Hill, *M. M* ..... Zanesville, O.

Bell's Gap R. R. 4-9 g. 25 m. 5 lo. 148 cars.
R. G. Ford, *Supt. & Pur. Agt* ..... Bellwood, Pa.
Geo. Van Brunt, *M. M* ..... Bellwood, Pa.
A. Zimmerman, *M. C. B* ..... Bellwood, Pa.
Belt R. R. 4-8½ g. 12 m. 10 lo.
W. P. Ijams, *Supt* ..... Indianapolis, In.
Belt Ry. 4-8½ g. 27 m
Jas. D. Carson, *Gen. Man* ..... Chicago, Ill.
R. W. Johnson, *M. M* ..... Chicago, Ill.
Bennington & Glastonbury. 4-8 g. 10 m.
R. C. Root, *Pres* ..... Bennington, Vt.
Bennington & Rutland Ry. 4-8½ g. 59 m. 10 lo. 236 c.
E. D. Bennett, *Supt. & Pur. Agt.* Bennington, Vt.
Chas. McMasters, *M. M* ..... Rutland, Vt.
Berlin Branch R. R. (*See Han. Junc., Han. & Gett.*)
Bladen, Columbus & Florida. 4-8½ g. 16 m. 2 lo. 2 c.
John Colville, *Pres* ..... Wilmington, N. C.
Bodie & Benton Ry. & Com. Co. 3 g. 34 miles.
Thomas Holt, *Supt. & Pur. Agt* ..... Bodie, Cal.
E. H. Barton, *M. M. & C. B* ..... Bodie, Cal.
Boston, Barre & Gardner. 4-8½ g. 37 m. 8 lo. 108 c.
Supt. & P. A .. Worcester, Mass.
Frank L. Goodwin, *M. M* ..... Worcester, Mass.
Boston, Hoosac Tunnel & W'n Ry.
4-8½ g. 87 m. 18 lo. 1,038 cars.
H. L. Morrill, *Gen. Man* .. Mechanicsville, N. Y.
C. H. Cory, *Pur. Agt* ..... Mechanicsville, N. Y.
C. H. Cory, *Supt. & M. M.* Mechanicsville, N. Y.
John S. Ellis, *M. C. B* ..... Mechanicsville, N. Y.
Boston, Revere Beach & Lynn R. R. 3 g. 9 m. 7 lo. 46 c.
C. A. Hammond, *Supt. & P. Agt.* Boston, Mass.
R. D. Sutherland, *M. M* ..... Boston, Mass.
John Coghlan, *M. C. B* ..... Boston, Mass.
Boston, Winthrop & Point Shirley R. R.
3 g. 10 m. 1 lo. 8 c.
C. A. Parks, *Supt* ..... Boston, Mass.
J. W. Davis, *M. M* ..... Winthrop, Mass.
Boston & Albany R. R. 4-8½ g. 372 m. 245 lo. 6,111 c.
W. H. Barnes, *Gen. Man* ..... Boston, Mass.
Edw. Gallup, *Gen. Supt* ..... Springfield, Mass.
A. B. Underhill, *Supt. M. P* ... Springfield, Mass.
F. D. Adams, *Gen. M. C. B* ..... Allston, Mass.
J. T. Chamberlain, *For. C. Shop.* Allston, Mass.
H. B. Chesley, *Div. Supt* ..... Boston, Mass.
G. H. Colby, *Div. M. M* ..... Boston, Mass.
C. E. Grover, *Div. Supt* ..... Springfield, Mass.
H. W. Eddy, *Div. M. M* ..... Springfield, Mass.
J. B. Weston, *For. Car Sh.* Springfield, Mass.
W. H. Russell, Jr., *Div. Supt.* E. Albany, N. Y.
T. B. Purvis, *Div. M. M* .. East Albany, N. Y.
J. E. Doran, *For. Car Sh* .. East Albany, N. Y.
Boston & Lowell R. R.
4-8½ g. 555 m. 147 lo. 3,262 cars.
C. S. Mellen, *Gen. Supt* ..... Boston, Mass.
F. H. Nourse, *Pur. Agt* ..... Boston, Mass.
Jas. K. Taylor, *Supt. R. S. & M.* Concord, N. H.
So. Div.: J. F. Crockett, *Supt* ..... Boston, Mass.
H. S. Kolseth, *M. M* ..... Boston, Mass.
No. Div.: Geo. A. Todd, Supt ..... Concord, N. H.
Geo. E. Shepard, *Pur. Agt* .. Concord, N. H.
C. C. Aspinwall, *M. M* ..... Concord, N. H.
Wh. Mt. Div.: W. A. Stowell, *Supt.* Woodsville, N. H.
Geo. A. Ferguson, *M. M* .. Lake Village, N. H.
Boston & Maine R. R. 4-8½ g. 491 m. 209 lo. 4,660 c.
J. T. Furber, *Gen. Man* ..... Boston, Mass.
Geo. J. Fisher, *Pur. Agt* ..... Boston, Mass.
Wm. Smith, *Supt. M. P* ..... Boston, Mass.
D. C. Richardson, *M. C. B* ..... Lawrence, Mass.
West. Div.: Wm. Merritt, Jr., *Supt.* Boston, Mass.
East. Div.: D. W. Sanborn, *Supt* .. Boston, Mass.
North Div.:
J. W. Sanborn, *Supt* .. Wolfboro Junc., N. H.
Boston & N. Y. Air Line R. R. (*See N. Y., N. H. & H.*)
Boston & Providence R. R. 4-8½ g. 67 m. 52 lo. 1,006 c.
A. A. Folsom, *Gen. Supt. & P. A.* Boston, Mass.
Geo. Richards, *M. M* ..... Roxbury, Mass.
Jno. Lightner, *M. C. B* ..... Roxbury, Mass.
Bowling Green & Toledo R. R. 4-8½ g. 6 m. 2 lo. 4 c.
Wm. A. Wiggins, *Gen. Man.* Bowling Green, O.
Wm. A. Wiggins, *Pur. Agt* .. Bowling Green, O.
Bradford, Bordell & Kinzua R. R. 3 g. 42 m. 6 lo. 82 c.
Bradford, Eldred & Cuba. 3 g. 54 m. 6 l. 158 c.
Tonawanda Valley & Cuba. 3 g. 60 m. 5 lo. 31 c.
J. V. D. Loomis, *Supt* ..... Attica, N. Y.
Jno. Delaney, *M. M. & C. B* ..... Bradford, Pa.
Brattleboro' & Whitehall R. R. 3 g. 36 m. 3 lo. 56 c.
(*Operated by Central Vermont.*)
Bridgton & Saco River R. R. 2 g. 16 m. 2 lo. 19 c.
Wm. F. Perry, *Gen. Supt* ..... Bridgton, Me.
M. M. Caswell, *M. M. & Pur. Agt.* Bridgton, Me.
Brighthope Ry. 3 g. 37 m. 4 lo. 118 cars.
Jas. R. Worth, *Supt* ..... Richmond, Va.
P. M. Buckingham, *Pur. Agt* Richmond, Va.
A. Gary, *Supt. Way & Works.* Winterpock, Va.
Robt. Kredell, *M. M* ..... Chester, Va.
Brooklyn, Bath & Coney Island R. R.
4-8½ g. 7 m. 8 lo. 36 cars.
Geo. A. Gunther, *Gen. Man* ... Brooklyn, N. Y.
Aug. Wolff, *M. M* ..... Brooklyn, N. Y.
Brooklyn, Flatbush & Coney Island Ry.
4-8½ g. 8 m. 8 lo. 54 c.
J. L. Morrow, *Supt. & P. A* ... Brooklyn, N. Y.
Wm. Finley, *M. M* ..... Brooklyn, N. Y.
Brooklyn & Rockaway Beach R. R.
4-8½ g. 3 m. 2 lo. 18 cars.
Wm. Warner, *Supt* ..... East New York, N. Y.
Brunswick & Western R. R. 5 g. 172 m. 13 lo. 170 c
A. A. Gaddis, *Gen. Man. & P. A.* Brunswick, Ga.
J. K. Nightengale, *Pur. Agt* ... Brunswick, Ga.
W. R. Kline, *M. M* ..... Brunswick, Ga.
Buff., N. Y. & Phil. R. R. 3 & 4-8½ g. 655 m. 120 l. 6,339 c.
Geo. S. Gatchell, *Gen. Supt* ..... Buffalo, N. Y.
W. W. Halsey, *Asst. to G. Supt* .. Buffalo, N. Y.
Allen Vail, *M. M* ..... Buffalo, N. Y.
Buff. Div.: Henry Dwyer, *Supt* ..... Buffalo, N. Y.
Roch. Div.: I. R. Watson, *Supt* ..... Olean, N. Y.
Pitts. Div.: E. H. Witter, *Supt* ..... Oil City, Pa.
H. J. Bookhammer, *M. M* ..... Oil City, Pa.
C. E. Turner, *M. M* ..... Olean, N. Y.
Burlington, Cedar Rapids & Northern Ry
4-8½ g. 989 m. 96 lo. 4,206 cars.
C. J. Ives, *Pres. & Gen. Supt.* Cedar Rapids, Ia.
Robt. Williams, *V. P. & G. Supt.* Cedar Rapids, Ia.
T. Stickney, *Pur. Agt* ..... Cedar Rapids, Ia.
R. W. Bushnell, *M. M. & C. B.* Cedar Rapids, Ia.
Burlington & Lamoille R. R. 4-8½ g. 35 m. 4 lo. 64 c.
G. L. Linsley, *Gen. Man. & Supt.* Burlington, Vt.
F. G. Brownell, *M. M* ..... Burlington, Vt.
Burlington & Mo. Riv. R. R. (in Neb.) (*See C. B & Q.*)
Burlington & North-West'n Ry. 3 g. 38 m. 3 lo. 97 c.
Burlington & Western R. R. 3 g. 15 m. 38 c.
E. S. Edger, *Supt* ..... Burlington, Ia.
Burlington & Ohio River R. R. 4-8½ g.
R. Tanner, *Pur. Agt* ..... Chicago, Ill.

C

California Northern R. R. 4-8½ g. 26 m. 2 lo. 17 c.
Andrew J. Binney, *Gen. Man* .. Marysville, Cal.
California Southern R. R. 4-8½ g. 127 m. 13 lo. 301 c.
J. N. Victor, *Supt* ..... National City, Cal.
J. M. Keith, *M. M* ..... National City, Cal.
Camden & Atlantic R. R. (*See Penna. R. R.;* (2) *Div.*)
Canada Southern Ry. (*See Mich. Cen.;* (2) *Div.*)
Canada Atlantic Ry. 4-8½ g. 135 m.
D. C. Linsley, *Man* ..... Ottawa, Ont.
M. Donaldson, *M. M* ..... Ottawa, Ont.
Canadian Pacific R. R. 4-8½ g. 1,742 m. 118 l. 2,726 c
W. C. Van Horne, *Gen. Man* ..... Montreal, Can.
Francis R. F. Brown, *Mech. Supt.* Montreal, Can.
W. H. Kelson, *Gen. Storekeeper* Montreal, Can.
E. Div.: *Gen. Supt* Montreal, Can.
W. Div.: J. M. Egan, *Gen. Supt* .. Winnipeg, Man.
Ontario Div.: W. White, *Gen. Supt* Montreal, Can.
Cape F'r & Yadkin Val. R. R. 4-8½ g. 112 m. 7 lo. 60 c.
W. M. S. Dunn, *Gen. Supt* ... Fayetteville, N. C.
Isaac W. Clark, *M. M. & C. B.* Fayetteville, N. C.
Cape Girardeau Southwestern Ry.
4-8½ g. 52 m. 3 lo. 51 cars.
Louis Houck, *Gen. Man* .. Cape Girardeau, Mo.
W. A. Penney, *Supt* ..... Cape Girardeau, Mo.
D. L. Meyers, *Pur. Agt* ... Cape Girardeau, Mo.
Fred Glover, *M. M* ..... Cape Girardeau, Mo.
Carolina Central R. R. (*See Ral. & Aug.*)
Carillon & Grenville Ry. 5-6 g. 13 m.
R. W. Shepard, *Pres* ..... Montreal, Can.
Carson & Colorado R. R. (*See Va. & Truckee*).
Catasauqua & Fogelsville. 4-8½ g. 25 m. 6 lo. 581 c.
C. W. Chapman, *Supt. & P. A.* Catasauqua, Pa.
J. Thomas, *M. M* ..... Hokendauqua, Pa.
Chas. J. Holbach, *M. C. B* ..... Catasauqua, Pa.

Catskill Mountain R. R. 3 g. 16 m. 2 lo. 26 cars.
Charles A. Beach, *Supt* ..... Catskill, N. Y.
Cazenovia, Canastota & De Ruyter. (*See U., I. & E.*)
Central and South-Western Railroads (Ga.).
5 g. 1,115 m. 145 lo. 2,008 cars.
W. G. Raoul, *Pres* ..... Savannah, Ga.
Wm. Rogers, *Gen. Supt* ..... Savannah, Ga.
C. H. Carson, *Pur. Agt* ..... Savannah, Ga.
Cen. Div.: D. D. Arden, *M. M* ..... Savannah, Ga.
T. F. Warwick, *M. M* ..... Augusta, Ga.
F. Devine, *M. C. B* ..... Savannah, Ga.
So.-West'n Div.: T. D. Kline, *Supt* ..... Macon, Ga.
D. M. Gugel, *M. M* ..... Macon, Ga.
S. A. Charpiot, *M. C. B* ..... Macon, Ga.
Central R. R. of N. J. (*See Phil. & Read.; N. J. Cen. Div.*)
Central American & Pacific Ry. 3 g. 67 m. 1 lo. 11 c
W. C. Fitzsimmons, *Gen. Supt.* Escuintla, Guat.
Central Branch Union Pac. (*See Mo. Pac.;* (3) *Div.*)
Central Iowa Ry. 4-8½ g. 412 m. 50 lo. 2,313 cars.
E. L. Dudley, *Supt* ..... Marshalltown, Ia.
J. G. Johnston, *Asst. Supt* ... Marshalltown, Ia.
D. D. Phelps, *Asst. Supt* ..... Monmouth, Ill.
C. H. Ackert, *Pur. Agt* ..... Marshalltown, Ia.
John Player, *M. M. & M. C. B.* Marshalltown, Ia.
Central Ontario Ry. 4-8½ g. 33 m. 4 lo. 66 cars.
J. B. McMullen, *Gen. Man* ..... Picton, Ont.
James Falconar, *M. M* ..... Trenton, Ont.
Central Pac. R. R. 4-8½ g. 4,303 m. 382 lo. 11,260 c.
A. N. Towne, *Gen. Man* ..... San Francisco, Cal.
J. A. Fillmore, *Gen. Supt* ... San Francisco, Cal.
R. H. Pratt, *A. G. Supt* ..... San Francisco, Cal.
J. R. Watson, *Gen. Pur. Agt* .. Sacramento, Cal.
A. J. Stevens, *Gen. M. M* ..... Sacramento, Cal.
W. McKenzie, *Asst. G. M. M* .. Sacramento, Cal.
Benj. Welch, *Gen. M. C. B* ..... Sacramento, Cal.
G. J. Turner, *Asst G. M. C. B.* Sacramento, Cal.
Western: Visalia & Tulare Divs. and Northern Ry.
A. D. Wilder, *Supt* ..... W. Oakland, Cal.
G. D. Welch, *M. M.* (W. Div.). W. Oakland, Cal.
W. B. Ludlow, *M. C. B.* (W. Div.) do.
S. Johnson, *M. M.* (T. Div.) ..... Tulare, Cal.
J. B. Wright, *Supt.* ..... Sacramento, Cal.
M. W. Cooley, *M. M.* (*S. Div.*) Rocklin, Cal.
Truckee Div.: J. H. Whited, *Supt.* Wadsworth, Nev.
Geo. Gregg, *M. M* ..... Wadsworth, Nev.
Wm. McPherson, *F. Car Sh* .. Wadsworth, Nev.
Humb't Div.: G. W. Coddington, *Supt.* Carlin, Nev.
W. F. Smith, *M. M* ..... Carlin, Nev.
J. C. Doughty, *For. Car Sh* ..... Carlin, Nev.
Salt Lake Div.: A. G. Fell, *Supt* ..... Ogden, Utah.
James Lamb, *M. M* ..... Terrace, Utah.
A. Sherburne, *For. Car Sh* ..... Ogden, Utah.
St. & Cop. R. R.: R. L. Myrick, *Supt* .. Stockton, Cal.
Los Angeles; and Yuma Divs. (So. Pac.):
E. E. Hewitt, *Asst. Supt* ... Los Angeles, Cal.
James Velsir, *M. M* ..... Los Angeles, Cal.
T. T. Gilieland, *For. Car Sh.* Los Angeles, Cal.
Arizona Divs (So. Pac.):
J. A. Muir, *Asst. Supt* ..... Tucson, Ariz.
W. F. Smith, *M. M* ..... Tucson, Ariz.
Rio Grande (S. Pac.) & El Paso (G. H. & S. A.) Divs.:
C. B Seymour, *Supt* ..... El Paso, Texas.
J. L. Bonner, *M. M* ..... El Paso, Texas.
H. C. Standish, *For. Sh* ..... El Paso, Texas.
Central Texas & N'w'n R. R. (*See Hous. & Tex. Cen.*)
Central Vermont R. R. 4-8½ g. 864 m. 185 lo. 2,789 c.
J. W. Hobart, *Gen. Man* ..... St. Albans, Vt.
J. M. Foss, *Gen. Supt* ..... St. Albans, Vt.
W. J. Robertson, *Supt. M. P* ..... St. Albans, Vt.
No. Div.: I. B. Futvoye, *Supt* ..... St. Johns, P. Q.
Rut. Div.: J. Burdett, *Supt* ..... Rutland, Vt.
N. L. Davis, *M. M. & C. B* ..... Rutland, Vt.
Brattleboro & Whitehall R. R., and
Brat. Div.: E. F. Brooks, *Supt* .. Brattleboro, Vt.
New London N'th R. R. 143 m. 22 lo. 303 c.
C. F. Spaulding, *Supt. & P. A.* New London, Ct.
I. N. Dow, *M. M* ..... New London, Ct.
S. O. Banks, *M C B* ..... New London, Ct.
Chagrin Falls & Southern R. R. 3 g. 6 m. 1 lo. 12 c.
W. Hutchings, *Gen. Man* ..... Chagrin Falls, O.
J. W. Williams, *Gen. Supt* .... Chagrin Falls, O.
Charleston & Savannah Ry. 5 g. 115 m. 15 lo. 200 c.
H. S. Haines, *Gen. Man* ..... Savannah, Ga.
C. S. Gadsden, *Gen. Supt* ..... Charleston, S. C.
H. A. Ulmo, *M. M* ..... Savannah, Ga.
Charlotte, Columbia & Augusta R. R. (*See Rich. & D.*)
Chateaugay R. R. 3 g. 34 m. 8 lo. 380 cars.
A. L. Inman, *Gen. Man* ..... Plattsburg, N. Y.
J. M. Davies, *Supt.* ..... Lyon Mountain, N. Y.
M. L. French, *Asst. Supt* ..... Plattsburg, N. Y.
Chatham Ry. 4-8½ g. 9 m.
J. B. Snowball, *Man* ..... Chatham, N. B.
Chattaroi Ry. 4-8½ g. 51 miles 11 loco. 483 cars.
F. H. Oliphant, *Gen. Man. & P. A.* Ashland, Ky.
J. R. Martin, *M. M* ..... Ashland, Ky.
Joseph P. Burleigh, *M. C. B* ..... Ashland, Ky.
Cheraw & Chester R. R. (*See Rich. & Dan.;* (2) *Div.*)
Cheraw & Darlington R. R. (*See Wil. & Wel.*)
Cheraw & Salisbury R. R. (*See Wil. & Wel.*)
Cherokee R. R. (*See East & West.*)
Cherry Valley R. R. 4-8½ g. 6 m. 3 lo. 6 cars.
E. T. Herndon, *Supt* ..... Midland, Mo.
Chesapeake, Ohio & South-Western.
4-9 g. 398 m. 62 lo. 1,345 c.
Jas. L. Frazier, *Supt* ..... Louisville, Ky.
H. E. Huntington, *Pur. Agt* ..... Louisville, Ky.
J. A. Dew, *Mast. Trans* ..... Paducah, Ky.
R. H. Briggs, *Supt. M. P* ..... Paducah, Ky.
D. L. Weaver, *M. M* ..... Elizabethtown, Ky.
Jno. Fitzgerald, *M. M* ..... Paducah, Ky.
Chesapeake & Ohio Ry. 4-8½ g. 642 m. 169 l. 5,120 c.
C. W. Smith, *Gen. Man* ..... Richmond, Va.
D. A. Sweet, *Asst. to Gen. Man.* Richmond, Va.
A. S. Emmons, *Pur. Agt* ..... Richmond, Va.
T. L. Chapman, *Supt. M. P* ..... Richmond, Va.
Eastern Div.: A. H. Wood, *Supt* .. Richmond, Va.
J. N. King, *M. C. B* ..... Richmond, Va.
J. B. Pierce, *M. M* ..... Richmond, Va.
Hunt. Div.: W. B. Ryder, *Supt* ..... Hinton, W. Va.
W. H. Thomas, *M. M* ... Huntington, W. Va.
H. C. Bassinger, *M. C. B.* Huntington, W. Va.
Lex. Div.: J. D. Yarrington, *Supt.* Lexington, Ky.
S. R. Tuggle, *M. M* ..... Lexington, Ky.
K. C. Div.: G. W. Bender, *Supt* .. Covington, Ky.
W. T. Smith, *M. M* ..... Covington, Ky.
Cheshire R. R. 4-8½ g. 80 m. 31 lo. 531 cars.
R. Stewart, *Gen. Man* ..... Keene, N. H.
H. H. Stone, *Pur. Agt* ..... Keene, N. H.
F. A. Perry, *M. M* ..... Keene, N. H.
A. E. Howard, *M. C. B* ..... Keene, N. H.
Chester & Lenoir Ry. (*See Rich. & Dan.;* (3) *Div.*)
Chicago, Bur. & Kan. City Ry. (*See C. B. & Q.*)
Chicago, Burlington & Quincy R. R.
4-8½ g. 3,608 m. 545 lo. 21,012 cars.
H. B. Stone, *Gen. Man* ..... Chicago, Ill.
(1) C., B. & Q., East of Mo. Riv.
J. D. Besler, *Gen. Supt* ..... Chicago, Ill.
Wm. Irving, *Gen. Pur. Agt* ..... Chicago, Ill.
G. W. Rhodes, *Supt. M. P.* ..... Aurora, Ill
Wm. Forsyth, *Mech. Eng* ..... Aurora, Ill.
Ill. Divs.: C. F Resseguie, *Supt* .... Galesburg, Ill.
Chi. Div.: Geo. Alexander, *Supt* ..... Aurora, Ill.
L. E. Johnson, *M. M* ..... Aurora, Ill.
Galesburg Div.: F. C. Rice, *Supt.* Galesburg, Ill.
Robert Colville, *M. M* ..... Galesburg, Ill.
St. L. Div.: W. C. Brown, *Supt.* Beardstown, Ill.
A. Forsyth, *M. M* ..... Beardstown, Ill.
Ia. & Mo. Divs.: W. F. Merrill, *Supt.* Burlington, Ia.
East. Div.: O. E. Stewart, *Supt.* Burlington, Ia.
Joel West, *M. M* ..... Burlington, Ia.
Mid. Div.: J. B. Maxon, *Supt* ..... Ottumwa, Ia.
West'n Div.: J. H. Duggin, *Supt* .... Creston, Ia.
C. W. Eckerson, *M. M* ..... Creston, Ia.
Chi., B. & Kan. C'y and St. L., Keo. & No.-W'n Rys.
Robt. Law, *Gen. Supt* ..... Keokuk, Ia.
W. H. Bartlett, *M. M* ..... Burlington, Ia.
(2) C. B. & Q., West of Mo. Riv.
G. W. Holdrege, *Gen. Man* ..... Omaha, Neb.
C. M. Wead, *Supply Agt* ..... Omaha, Neb.
D. Hawksworth, *M. M* ..... Plattsmouth, Neb.
C. M. Wead, *Storek'pr* ..... Plattsmouth, Neb.
Bur. & Mo. Riv. & Neb. Ry. Divs.:
T. E. Calvert, *Gen Supt* ..... Lincoln, Neb.
D. E. Thompson, *Supt* ..... Lincoln, Neb.
E. Bignell, *M. M* ..... Lincoln, Neb.
R. V. Div.: A. Campbell, *Supt* ..... McCook, Neb.
A. & N. Div.: J. McConniff, *Supt* ... Lincoln, Neb.
Chicago, Fairchild & Eau Claire R. R.
4-8½ g. 22 m. 4 lo. 28 cars.

N. C. Foster, *Gen. Man* ..... Fairchild, Wis.
C. I. Wickersham, *Pur. Agt* ..... Chicago, Ill.
Chicago, Iowa & Dakota Ry. 4-8½ g. 26 m
John Porter, *Gen Man* ..... Eldora, Ia.
Chicago, Milwaukee & St. Paul R. R.
4-8½ g. 5,201 m. 626 lo. 19,018 cars.
Roswell Miller, *Gen. Man* ... Milwaukee, Wis.
Jos. F. Tucker, *Asst. Gen. M.* Milwaukee, Wis.
J. T. Clark, *Gen. Supt* ..... Milwaukee, Wis.
A. J. Earling, *Asst. Gen. Supt.* Milwaukee, Wis.
J. T. Crocker, *Pur. Agt* ..... Milwaukee, Wis.
J. M. Lowry, *Gen. M. M* ..... Milwaukee, Wis.
E. Fairbairn, *M. M* ..... Milwaukee, Wis
John Bailie, *Supt. Car Dept* ... Milwaukee, Wis
W. E. Kittridge, *M. C. B* ..... Milwaukee, Wis
(1) C. & M. and C. & C. B. in Ill.:
G. O. Clinton *Supt* ..... Chicago, Ill.
Ch. & C. B in Ia.:
R. B. Campbell, *Supt* ..... Marion, Wis
La C. & Wis. Val. Divs.:
W. G. Collins, *Supt* ..... Milwaukee, Wis
P. du C. & M. Pt. Divs.:
S. J. Collins, *Supt* ..... Milwaukee, Wis.
(2) C. H. Prior, *Asst. Gen. Supt* .. Minneapolis, Minn.
H. & D. Div.: W. M. Kellie, *Supt.* do.
J. O. Pattie, *M. M* ..... Minneapolis, Minn.
Ia. & Minn. Div.: H. R. Williams, *Supt.* do.
S. Minn. Div.: F. D. Underwood, *Supt.* Lacrosse, Wis.
Riv. & Dub. Divs.: C. W. Case, *Supt.* Dubuque, Ia.
S. Charnley, *M. M* ..... Dubuque, Ia.
Ia. & Da. Div.: G. W. Sanborn, *Supt.* Mason City, Ia.
S. Cy. & Da. Div.: W. J. Underwood, *Supt.* Sioux Cy. Ia.
F. H. Moulton, *M. M* ..... Yankton, Dak.
J M. Horan, *For* ..... Yankton, Dak.
(3) D A. Olin, *Asst. Gen. Supt* ..... Racine, Wis.
R. & S. W. Divs.: D. L. Bush, *Supt* ... Racine, Wis.
John Taylor, *M. M* ..... Racine, Wis
(4) Northern Div.: L. B. Rock, *Supt.* Milwaukee, Wis.
Wm. E. Kittredge, *M. C. B* .. Milwaukee, Wis
Chicago, Rock Island & Pac. Ry.
4-8½ g. 1,381 m. 309 lo. 8,367 cars.
R. R. Cable, *Pres. & Gen. Man* ..... Chicago, Ill.
E. St. John, *Asst. Gen. Man* ..... Chicago, Ill.
A. Kimball, *V. P. & Gen. Supt* ..... Chicago, Ill.
H. F. Royce, *Asst. G. Supt* ..... Davenport, Ia.
F. A. Marsh, *Pur. Agt* ..... Chicago, Ill.
T. B. Twombly, *Gen. M. M* ..... Chicago, Ill.
B. K. Verbryck, *Gen. M. C. B* ..... Chicago, Ill.
Ill. Div.: R. H. Chamberlin, *Supt* ..... Chicago, Ill.
R. Biester, *M. M* ..... Chicago, Ill.
Sam'l Pullman, *M. C. B* ..... Chicago, Ill.
Ia. Divs.: Jno. Given, *Supt* ..... Des Moines, Ia.
J. G. Crockett, *M. M* ..... Stuart, Ia.
Jas. E. Morrill, *M. M* ..... Davenport, Ia.
Chas. M. Leonard, *M. C. B* ..... Davenport, Ia.
K. & Des. M. Div.: Jno. Given, *Supt.* Des Moines, Ia.
S. W. Wakefield, *M. M* ..... Keokuk, Ia.
Henry Kummer, *M. C. B* ..... Keokuk, Ia.
So.-Wn. Div.: G. F. Walker, *Supt* ... Trenton, Mo.
R. O. Carscadin, *M. M* ..... Trenton, Mo.
Chas. R. Best, *M. C. B* ..... Trenton, Mo.
Chicago, Saginaw & Canada R. R. (*See Det., L. & N.*
Chicago, St. Louis & New Orleans R. R. (*See Ill. Cen.*
Chicago, St. Louis & Pittsburgh R. R.
4-9 g. 635 m. 202 lo. 3,510 cars.
James McCrea, *Manager* ..... Columbus, O.
Wm. Mullins, *Gen. Pur. Agt* ... Pittsburgh, Pa
Edward B. Wall, *Supt. M. P* ..... Columbus, O
1, 3 & 5 Divs.: J. F. Miller, *Supt.* Richmond, Ind
Robert Curtis, *M. M* ..... Columbus, O
J. L. Copeland, *G. F Car Shops.* Columbus, O
Wm. Swanston, *M. M* ..... Indianapolis, Ind.
W. C. Arp, *Gen. For* ..... Indianapolis, Ind.
2 & 4 Divs.: Chas. Watts, *Supt.* Logansport, Ind.
W. W. Reynolds, *M. M* ..... Logansport, Ind.
Chas. H. Starr, *G. F C. Shops.* Logansport, Ind.
Chicago, St. Louis & Wn. R. R. 4-8½ g. 152 m. 11 lo. 1,799 c.
F. E. Hinckley, *Gen. Man* ..... Chicago, Ill.
B. T. Lewis, *Pur. Agt* ..... Chicago, Ill.
A. H. Crocker *Supt* ..... Streator, Ill
J. N. Chilson, *M. C. B* ..... Streator, Ill
Chicago, St. Paul, Minneapolis & Omaha Ry.
4-8½ g. 1,301 m. 181 lo. 5,459 cars.
J. M. Whitman, *Gen. Supt* ..... St. Paul, Minn.
W. H. S. Wright, *Pur. Agt* ..... St. Paul, Minn.
Matt. Ellis, *M. M* ..... St. Paul, Minn.
J. J. Ellis, *Asst. M. M* ..... St. Paul, Minn.
H. L. Preston, *M. C. B* ..... Hudson, Wis.
Ea. & No. Div.: A. A. Hobart, *Supt.* St. Paul, Minn.
St. Paul and Sioux City Div.:
H. Spencer, *Supt* ..... St. James, Minn.
H. C. Anderson, *Asst. M. M* ..... Sioux Cy, Ia.
Neb. Div.: Jas. McCabe, *Supt* ..... Omaha, Neb.
Chicago & Alton R. R. 4-8½ g. 849 m. 213 lo. 6,168 c.
C. H Chappell, *Gen. Man* ..... Chicago, Ill.
T. M. Bates, *Supt. of Trans* ... Bloomington, Ill.
A. V. Hartwell, *Pur. Agt* ..... Chicago, Ill.
Wm. Wilson, *Supt. of Mach* ... Bloomington, Ill.
Jos. Townsend, *G. For. Car Dept.* do.
Chi. Div.: A. M. Richards, *Supt.* Bloomington, Ill.
St. L. & K. C. Div.: S. D. Reeves, *Supt.* Roodhouse, Ill.
Wm. Hill, *M. M* ..... Slater, Mo.
Chicago & Atlantic Ry. 4-8½ g. 269 m.
F. Broughton, *Gen. Man* ..... Chicago, Ill.
J. H. Parsons, *Supt* ..... Chicago, Ill.
C. J. Domville, *M. M* ..... Huntington, Ind.
Chi. & East'n Ill. 4-8½ g. 252 m. 56 lo. 3,870 cars.
O. S. Lyford, *Gen. Supt* ..... Chicago, Ill.
D. R. Patterson, *Pur. Agt* ..... Chicago, Ill.
P. W. Drew, *M. Trans* ..... Chicago, Ill.
Allen Cooke, *M. M* ..... Danville, Ill.
Chicago & Grand Trunk Ry. (*See Grand Trunk.*
Chicago & Great Southern Ry.
4-8½ g. 124 m. 4 lo. 122 c.
Geo. C. Kimball, *Rec* ..... Attica, Ind.
H. Crawford, Jr., *Supt* ..... Chicago, Ill.
Chicago & Iowa R. R. 4-8½ g. 104 m. 18 lo. 237 cars.
T. J. Potter, *Gen. Man* ..... Chicago, Ill.
W. H. Holcomb, *Gen. Supt* ..... Rochelle, Ill.
H. S. Bryan, *M. M* ..... Aurora, Ill.
Chicago & Northwestern Ry.
4-8½ g. 3,761 m. 647 lo. 21,200 cars.
Marvin Hughitt, *2d V. Prs. & G. M.* Chicago, Ill
C. C. Wheeler, *Gen. Supt* ..... Chicago, Il
R. H. McCullough, *Ass't Gen. Supt.* Chicago, Ill.
R. W. Hamer, *Pur. Agt* ..... Chicago, Ill.
Geo. W. Tilton, *Supt. M. P. & M.*; and
W. A. Scott, *A. Supt. M. P. & M* .. Chicago, Ill
Wis. Div.: Ed. J. Cuyler, *Supt* ..... Chicago, Ill.
Gal. Div.: Chas. Murray, *Supt* ..... Chicago, Ill.
Pen'a Div.: W. F. Fitch, *Supt* ..... Escanaba, Mich.
J. Symons, *M. M* ..... Escanaba, Mich.
Mad. Div.: C. A. Swineford, *Supt* .. Baraboo, Wis.
H. D. Page, *M. M* ..... Baraboo, Wis.
Minn. & Dak. Divs.: S. Sanborn, *Asst. Gen. Supt.*
Wis., St. P. & Dak. Div.:
W. A. Scott, *M. M* ..... Winona, Minn.
Dak. Cen. Ry.: J. S. Oliver, *Supt* .... Huron, Dak.
Ia. Div.: H. G. Burt, *Supt* ..... Boone, Ia.
Geo. W. Lowe, *M. M* ..... Clinton, Ia.
No. Ia. Div.: M. Hopkins, *Supt* ... Eagle Grove, Ia.
Win. & St. P. Div.:
W. P. Cosgrave, *Supt* ..... Winona, Minn.
Wm. Smith, *M. M* ..... Winona, Minn.
Chicago & West Michigan:
4-8½ g. 409 m. 47 lo. 1,629 cars.
J. B. Mulliken, *V. P. & G. Man.* Muskegon, Mich.
J. K. V. Agnew, *Gen. Supt.* Grand Rapids, Mich.
Allen Bourne, *Pur. Agt* ..... Detroit, Mich.
W. F. N. Davis, *M. M* ..... Muskegon, Mich.
Chicago & West'n Ind. R. R. 4-8½ g. 50 m. 12 lo. 150 c.
James D. Carson, *Gen. Man* ..... Chicago, Ill.
R. W. Johnson, *M. M* ..... Chicago, Ill.
Cincinnati, Columbus & Hocking Val. Ry.
4-9 g. 25 m. 2 lo. 77 cars.
D. P. Hyatt, *Gen Man* ..... Dayton, O.
Cin., Georgetown & Portsmouth. 3 g. 35 m. 3 lo. 45 c.
M. Simmons, *Supt* ..... Cincinnati, O
F. Enler, *M. M* ..... Cincinnati, C.
Cincinnati & Green River Ry. 5 g. 17 m. 2 lo. 50 c.
G. B. Harper, *Supt* ..... Yosemite, Ky.
F. S. Biggs, *M. M* ..... Yosemite, Ky
Cin., Hamilton & Dayton R. R. 4-9 g. 352 m. 92 l. 2,932 c.
W. F. Stark, *Asst. Supt* ..... Cincinnati, O
John Black, *Gen. M. M* ..... Lima, O
W. H. H. Allison, *M. C. B* ..... Cincinnati, O.
Cincinnati, Hamilton & Indianapolis R. R.
4-8½ g. 98 m
C. J. Hepburn, *Supt* ..... Cincinnati, O
Day. & Mich. Div.:

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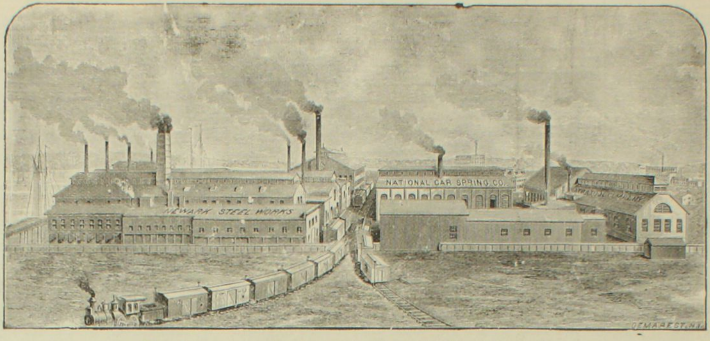

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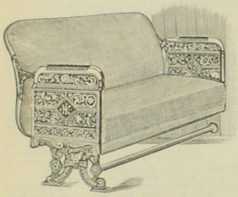

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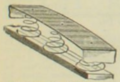
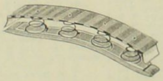


Section for Spring Seat.



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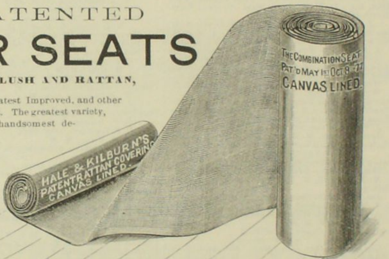

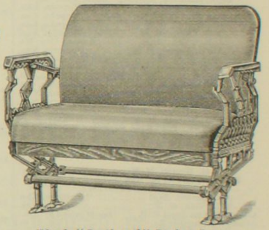

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After many experimental trials I have succeeded in accomplishing much toward increasing the durability of colors, and lessening the extravagant waste which has long attended the present system of outside painting. And in order to prove beyond a doubt the great value of my discovery, I waited FIVE YEARS in order to test its utility. Before announcing it publicly, I selected my own House and Stable—which had been painted five years previous—had the paint washed clean, and then put on one coat of the MARINE VARNISH, which *gave it an excellent gloss and restored the old Paint to its original color, freshness and appearance of new paint.* So perfect is the resemblance that it is difficult to convince those who are ignorant of the fact, that it has not been repainted.

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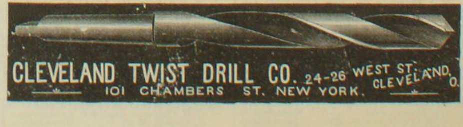

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J. S. Patterson, *M. of Mach.& M.C.B.* Cincinn., O
Cincinnati, New Orleans & Texas Pacific Ry. Co.
5 g. 846 m. 123 lo. 3,464 cars.
John C. Gault, *Gen. Man*........ Cincinnati, O
Richard Carroll, *Gen. Supt*....... Cincinnati, O.
R. W. Healey, *Gen. Pur. Agt*..... Cincinnati, O.
James Meehan, *S. M. P. & M*... Cincinnati, O.
Cin. So. Div.: W. W. Wells, *Supt*.. Somerset, Ky.
J. L. Tomlinson, *Asst. S. M. P*.. Ludlow, Ky
John Richardson, *M. C. B*.... . Cincinnati, O.
A. Thomson, *M. M*... ... Chattanooga, Tenn.
Ala. Gr. S'n Div.: D. McLaren, *Supt*., and
George Manuell, *M. M*... Chattanooga, Tenn
J. M. Kelly, *M. C. B*..... Chattanooga, Tenn.
V. & M. Div.: E. F. Raworth, *Supt*., and *M. M*..... Vicksburg, Miss.
V.S. & P. Div.: M. S. Belknap, *Supt*. Monroe, La.
W. Bell Smith, *M. M. & C. B*..... Monroe, La.
New Orleans & North-Eastern R. R.
Edmund L. Tyler, *Supt*..... New Orleans, La.
I. W. Fowle, *M. M*............. Meridan, Miss.
Cincinnati Northern Ry.
Geo. L. Barringer, *Gen. Man* ... Cincinnati, O.
Cincinnati, Richmond & Chicago R. R. 4-9 g. 37 m.
C. J. Hepburn, *Supt*. .... Cincinnati, O.
Cincinnati, Selma & Mobile R.R. 5 g. 71 m. 6 lo. 148 c.
A. McCollister, *Supt*................ Selma, Ala.
H. L. Wright, *Pur. Agt*............. Selma, Ala.
J. M. Levis, *M. M*.... .... Marion, Ala.
Cincinnati, Van Wert & Michigan R. R.
4-9 g. 94 m. 8 lo. 168 cars.
E. Garrison, *Supt*................. Van Wert, O.
D. R. Ennis, *Pur. Agt*...... ...... Van Wert, O.
H. H. Garr, *M. M. & M. C. B* ..... Van Wert, O.
Cin., Wabash & Mich. Ry. 4-8½ g. 165 m. 13 lo. 402 c.
Norman Beckley, *Gen. Man. & P. A.* Elkhart, Ind.
O. W. Lamport, *Supt* .... Wabash, Ind.
S. B Tinker, *M. M. & M. C. B* ... Wabash, Ind
Cin., Wash. & Balt. 4-8½ g. 312 m. 65 lo. 1,889 cars
Jas. H. Stewart, *Gen. Man*....... Cincinnati, O.
Edw. Evans, *M. M* .... Chillicothe, O.
T. G. Duncan, *Supt. Car Dept*....... Zaleski, O.
Cincinnati, Wheeling & New York R.R. 4-8½ g. 13 m.
T. M. Atkinson, *Gen. Man*......... Batesville, O.
Cincinnati & Eastern Ry. 3 g. 68 m. 6 lo. 133 cars.
4-8½ g. 50 m. 3 lo.
S. Woodward, *Rec* .... Cincinnati, O.
G. H. Wilber, *Gen. Sup. & Pur. Agt*. Cincinnati, O.
A. Donaldson, *M. M*.. .... Newtown, O.
P. W. Naughton, *M. M*. .... Batavia, O.
Cincinnati & South-Eastern Ry. 4-8½ g. 18 m.
John V. Patton, *Gen. Man*... . Newport, Ky.
Clarksburg, Weston & Glenville R. R.
3 g. 26 m. 3 lo. 45 cars.
A. H. Kunst, *Pres. & Gen. Man*. Weston, W. Va.
Sam. A. Steel, *M. M*............ Weston, W. Va.
F. Dillie, *M. C. B*........ .. .... Nottingham, O.
Cleveland, Columbus, Cincinnati & Indianapolis & St Louis Rys. and Dayton & Union R. R.
4-8½ g. 785 m. 246 lo. 7,988 cars.
E. B. Thomas, *Gen. Man*......... Cleveland, O.
J. L. Yale, *Pur. Agt*.......... .... Cleveland, O.
W. F. Turreff, *Gen. M. M*......... Cleveland, O.
Col. & Cin. Div.: Robt. Blee, *Supt* . Cleveland, O.
Wm. Garstang, *M. M*.......... Cleveland, O.
A. G. Steinbrenner, *G. For. Car Dept*. do.
Ind'p'lis Div.: John O. Ewan, *Supt*. Ind'polis, Ind
T. W. Ranson, *M. M* ..... Brightwood, Ind.
N. Mark, *G. For. Car Dept*. Brightwood, Ind.
Ind.& St L Ry.: Tho. Burrows, *Supt*. St. Louis, Mo.
T. W. Ranson, *M. M. & C.B.* Brightwood, Ind.
Day. & Un. Rd: J. H. Barrett, *Supt*... Dayton, O.
H. S. Gordon, *For. M. Shops* ...... Dayton, O.
Clevel'd, Delphos & St. Louis R.R. 3 g. 56 m. 3 lo. 39 c.
I. H. Burgoon, *Gen. Man*.......... Delphos, O.
B. F. Marshall, *M. M*.............. Delphos, O.
Cleveland, Indiana & St. Louis R. R.
4-8½ g. 19 m. 2 lo. 20 cars.
J. A. Larned, *Rec. & Supt*...... Anderson, Ind.
Cleveland, Mt. Vernon & Delaware R. R.
4-9 g. 144 m. 24 lo. 886 c.
N. Monsarrat, *Gen Supt*.............. Akron, O.
G. M. Taylor, *M. M. & C. B*..... Mt. Vernon, O.
Cleve., Youngstown & Pitts. R. R. 3 g. 30 m. 3 lo 138 c.
D. T. Lumley, *Gen. Supt*.. .... Alliance, O.
C. H. Dorman, *M. M. & M. C. B*.... Alliance, O.
Cleveland, Lorain & Wheeling Ry.
4-8½ g. 158 m. 31 lo. 1,878 cars.
Oscar Townsend, *Gen. Man* ...... Cleveland, O.
Wm. Thornburg, *Supt*......... . .. Lorain, O.
C. H. Waburton, *M. M*..... .... Lorain, O.
A. Warburton, *Gen. For*............ Lorain, O.
Cleveland & Canton R. R.
3 g. 160 m. 26 lo. 1,036 cars.
Samuel Briggs, *Gen. Man*..... .. Cleveland, O.
John Bean, *M. M*.................. . Canton, O
Cleve. & Marietta R. R. (*See Wheel. & Lake Erie*.)
Cleveland & Pittsburgh. (*See Penna. Co.; (4) Div.*)
Clifton & Port Hudson R. R. 4-8½ g. 22 m. 3 lo. 12 c.
John Bradley, *Supt*........ .. New Orleans, La.
W. F. Lockwood, *M. M*........... . Clinton, La.
E. D. Anderson, *M. M*........ Vicksburg, Miss.
Clove Branch R. R. 4-8½ g. 8 m. 1 lo. 61 cars.
C. L. Kimball, *Supt*...... . Matteawan, N. Y.
W. G. Vanbuskirk, *M. M*... Dutchess Jc., N. Y.
Coburg, Peterborough & Marmora Ry.
5-6 g. 47 m. 5 lo. 255 cars.
Jas. R. Barber, *Gen. Supt*... .... Cobourg, Ont.
Jas. Clark, *M. M*... .... Cobourg, Ont
John Tinney, *M. C. B*............ Cobourg, Ont.
Colorado Central R. R. (*See Un. Pac.; (4) Div.*)
Columbia & Greenville R. R. (*See Rich. & D.; (3) Div.*)
Columbia & Puget Sound R.R. 3 g. 21 m. 7 lo. 114 c.
J. L. Howard, *Gen. Supt*.. San Francisco, Cal.
Columbus, Hocking Valley & Toledo Ry.
4-9 g. 324 m. 90 lo. 7,353 cars.
G. R. Carr, *Gen. Supt*............... Columbus, O
W. M. Greene, *Pur. Agt*........... Columbus, O.
Ira G. Hutchins, *M. M*.... .. .... Columbus, O.
J. M. Rockafield, *M. C. B*.... ... . Columbus, O.
Tol. Div.: M. T. Seymour, *Supt*...... Columbus, O.
Hock. V. Div.: M. P. L. Booth, *Supt*. Columbus, O.
Ohio Riv. Div.: C. D. Norris, *Supt*....... Logan, O.
Columbus & Eastern R. R. In progress
J. E. Redfield, *Pres*....... ... Columbus, Ohio.
Columbus & Maysville Ry. (*See Cin. & East.*)
Columbus & Rome R. R. 3 g. 33 m. 3 lo. 30 cars.
M. E. Gray, *Supt* .... Columbus, Ga.
Columbus & Western Ry. 5 g. 89 m. 6 lo. 53 cars
E. A. Flewellen, *Gen. Man*. ... Columbus, Ga.
R. A. Bridges, *M. M* .... Opelika, Ala.
Concord R. R. 4-8½ g. 141 m. 41 lo. 1,264 cars
H. E. Chamberlin, *Supt. & P. Agt*. Concord, N.H.
J. T. Gordon, *M. M. & C. B*.. . Concord, N. H
Concord & Claremont R. R. (*See Northern of N. H.*
Conn. Riv. and Ver. Val. R. Rs. 4-8½ g. 130 m. 42 lo. 554 c.
J. Mulligan, *Supt. & Pur. Agt*. Springfield, Mass.
W. H. Stearns, *M. M. & M. C. B*. Springfield, Mass.
Conn. & Passumpsic Rivers R. R. (*See Passumpsic*.)
Cooperstown & Susquehanna Valley R. R.
4-8½ g. 16 m. 2 lo. 14 cars.
Andrew Shaw, *Pres* .... Cooperstown, N. Y.
A. Mumford, *M. M*......... Cooperstown, N. Y.
Corning, Cowanesque & Antrim Ry. (*See Syr., G. & C.*)
Cornwall R. R. 4-8½ g. 12 m. 5 lo. 166 cars
J. M. Havard, *G. Supt. & M. M*.... Lebanon, Pa
Levi Blonch, *M. C. B* .... Lebanon, Pa.
Cornwall & Lebanon R. R. 4-9 g. 5 m.
J. C. Jennings, *Supt* .... Lebanon, Pa.
Coudersport & Port Allegheny R. R.
3 g. 17 m. 2 lo. 64 cars.
B. A. McClure, *Gen. Supt*.... Coudersport, Pa.
Credit Valley Ry. 4-8½ g. 184 m. 22 lo. 535 cars.
Wm. Whyte, *Gen. Supt*..... ..... Toronto, Ont.
John Macnab, *Pur. Agt*..... ..... Toronto, Can
D. Preston, *Mech. Supt*....... ... Toronto, Can
Crescent Springs Ry. 3 g. 12 m. 2 lo. 50 c.
David Joyce, *Gen. Man*........ ... Lyons, Ga.
W. R. Bourm, *Asst Gen. Man*. Shell Lake, Wis.
John Devereaux, *Gen. Supt*.. Shell Lake, Wis.
C. I. Wickersham, *Pur. Agt*...... Chicago, Ill.
Ira Wood, *Supt. M. P. & M*... Shell Lake, Wis.
John Blackburn, *M. C. B* .... Shell Lake, Wis.
Crooked Creek R. R. 3 g. 9 m. 1 lo. 37 cars.
Walter C. Willson, *Gen. Man*. Webster City, Ia.
Geo. W. Post, *Pur. Agt*............. Lehigh, Ia.

Crown Point Iron Co.'s R. R. 3 g. 13 m. 3 lo. 135 c.
A. L. Inman, *Gen. Man*..... . Plattsburg, N. Y.
H. L. Reed, *Pur. Agt*....... Crown Point, N. Y.
Jas. McMann, *Supt*......... Crown Point, N. Y.
C. W. Sanders, *M. M*.... .. Crown Point, N. Y.
Cumberland Ry. 4-8½ g. 32 m. 1 lo. 64 c.
J. A. Killam, *Gen. Man*......... Parsboro, N. S.
K. McKinnon, *M. M*............. Parsboro, N. S.
Cumberland Valley R. R. 4-9 g. 127 m. 25 lo. 474 cars.
J. F. Boyd, *Supt*...... ..... Chambersburg, Pa.
A. S. Hull, *M. M*...... .. .. Chambersburg, Pa.
C. Wicke, *M. C. B*...... ... Chambersburg, Pa.
Cumberland & Maurice River R. R. 4-8½ g. 20 m.
L. H. Dowdney, *Supt*........ Port Norris, N. J.
Cumberland & Penn. R. R. 4-8½ g. 55 m. 28 lo. 625 c.
P. L. Burwell, *Gen Supt & P A*. Cumberland, Md.
N. W. Howson, *Mast. of Mach*. Mt. Savage, Md.
Nathan Binix, *M. C. B*....... ... Mt. Savage, Md.

D

Danville & New River R. R. 3 g. 43 m. 2 lo. 30 c.
W. T. Sutherlin, *Gen. Man*....... Danville, Va.
W. T. Whittaker, *M. M*............ Danville, Va.
Danbury & Norwalk R. R. 4-8½ g. 36 m. 7 lo. 112 c.
C. M. Crawford, *G. Supt. & P. A*.. S. Norwalk, Ct.
W. H. Wilkinson, *M. M. & C. B*. Danbury, Conn.
Danville, Mocksville & So.-Wn. R. R. 3 g. 28 m.
H. M. Shivler, *Supt*........... Leakesville, N. C.
Danville, Olney & O. R. R.R. 4-8½ g. 78 m. 3 lo. 34 c.
C. E. Henderson, *Rec. & Man*........ Olney, Ill.
W. A. Bell, *M. M & C. B*.. .... .. Kansas, Ill
Dayton & Toledo R. R. 3 g. 96 m.
C. E. Henderson, *Gen. Man*...... .. Dayton, O.
J. E. Gimperling, *Supt* .... Dayton, O.
Dayton & Union R. R. (*See Clev., Col., Cin. & Ind.*)
Dayton & Michigan R. R. (*See Cin., Ham. & Day.*)
Dayton & Ironton R. R.
C. E. Henderson, *Gen. Man*. Indianapolis, Ind.
H. C. Norton, *Pur. Agt*... . Indianapolis, Ind.
E. Heisrodt, *Supt. Mach*..... . .... Dayton, O.
Del. Lackawanna & W. and N. Y., Lack.& W. R. Rs.
4-8½ g. 930 m. 436 lo. 31,989 cars.
Wm. F. Halstead, *Gen. Supt*.. ... Scranton, Pa.
G. W. B. Cushing, *Pur. Agt*. .. New York, N. Y
Walter Dawson, *Mast. of Mach*... Scranton, Pa.
Robt. McKenna *M. C. B* .. . . Scranton, Pa.
Bloomsb'g Div.: C. Graham, *M. M*.. Kingston, Pa.
Utica Div.: A. C. Salisbury, *Supt*.... Utica, N. Y.
Thos. Thatcher, *M. M*............ Utica, N. Y.
Morris & Essex Div.; Sussex; P. & D. and C. R. Rs.
A. Reasoner, *Supt*.... .... Hoboken, N. J.
W. H. Lewis, *M. M*......... Kingsland, N. J.
J. W. Baker, *Mast. Car Rep*. .... Dover, N. J
Oswego & Syracuse Div.:
W. K. Niver, *Supt*.............. Oswego, N. Y.
Jas. Buchanan, *M. M*. ..... Syracuse, N. Y.
Syracuse, Binghamton & New York R. R.
4-8½ g. 81 m. 20 lo. 598 cars.
W. K. Niver, *Gen. Supt*... ... Syracuse, N. Y.
Jas. Buchanan, *M. M*.. ...... Syracuse, N. Y.
Cayuga Div.: *Supt* Ithaca, N.Y.
Buffalo Div.: T. B. Griffith, *M. M*.. Buffalo, N. Y.
Delaware, Maryland & Virginia R. R.
4-8½ g. 101 m. 7 lo. 145 cars.
Tho. Groom, *Supt*.... .... Lewes, Del.
Geo. Messick, *M. M*...... .... Lewes, Del.
W. H. Virden, *M. C. B*.............. Lewes, Del.
Delaware River R. R. 4-8½ g. 20 m. 3 lo. 8 cars.
E. H. Green, *Supt*.......... Pedricktown, N. J.
Delaware & Hudson Canal Co.
4-3 and 4-8½ g. 634 m. 180 lo. 10,799 cars.
C. F. Young, *Pres & Gen. Man* Honesdale, Pa.
H. G. Young, *Asst. Gen. Man*.... Honesdale, Pa.
J. White Sprong, *Pur. Agt*....... Albany, N. Y.
R. C. Blackall, *Supt. of Mach*..... Albany N. Y.
Susq. Div.: C. D. Hammond, *Supt*. Albany, N. Y.
Tho. Howard, *M. M*............ Oneonta, N. Y.
J. R. Skinner, *M. C. B*. .... Oneonta, N. Y.
Sar. & Ch. Divs.: T. Voorhees, *Supt*... Troy, N. Y.
J. L. Corey, *M. M*... .... . Green Island, N. Y.
Chr. Körner, *M. C. B*.. .. Green Island, N. Y.
Pa. Div.: R. Manville, *Supt & Pur Agt*. and
S. H. Dotterer, *M. M*.... .... Carbondale, Pa.
T. Orchard, *M. C. B*......... Carbondale, Pa.
Denver Circle R. R. 3 g. 12 m. 7 lo. 15 cars
Theo. C. Henry, *Gen. Man*......... Denver, Col.
T. W. Pelham, *Gen. Supt*......... Denver, Col.
Denver, Utah & Pacific R. R. 3 g. 34 m. 4 lo. 171 c.
L. M. Fouts, *Supt*...... .... Denver, Col.
Denver & New Orleans. 4-8½ g. 140 m. 11 lo. 400 c.
C. W. Fisher, *Gen. Man*............ Denver, Col.
Chas. Wheeler, *Pur. Agt*.... ..... Denver, Col.
J. H. Kirk, *M. M. & M. C. B*. ... Denver, Col.
Denver & Rio Grande Ry. 3 g. 1,317 m. 222 lo. 5,932 c.
W. S. Jackson, *Rec*. .... Denver, Col.
C. M. Hobbs, *Pur. Agt* .... Denver, Col.
N. W. Sample, *Supt. M. P. & M* ... Denver, Col.
(1) Col & N. M. Div.: R. E. Ricker, *G. S*. Denver, Col
1st Div.: W. W. Borst, *Supt*....... S. Pueblo, Col.
2d Div.: Cole Lydon, *Supt*..... ... Alamosa, Col.
3d Div.: G. W. Cook, *Supt*........ Leadville, Col
4th Div.: R. M. Ridgway, *Supt*....... Salida, Col.
Denver, Rio Grande & Western Ry. 3 g. 369 m.
W. H. Bancroft, *Rec. & Gen. Supt*.. Salt Lake City, Utah.
A. L. Horner, *Ass't Supt*. Salt Lake City, Utah.
S. C. Smith, *M. M* ... ... Salt Lake City, Utah.
Des Moines, Osceola & Southern R. R.
3 g. 100 m. 7 lo. 253 cars
Jas. Donahue, *Supt*............ Des Moines, Ia.
Wm. Persing, *M. M*... .... Osceola, Ia.
Elias Tonet, *M. C. B*.............. Osceola, Ia.
Des Moines & Ft. Dodge. 4-8½ g. 144 m. 13 lo. 350 c.
C. N. Gilmore, *Supt* .... Des Moines, Ia.
John McGrayel, *M. M*...... Grand Junction, Ia.
E. A. Avery, *M. C. B* .... Grand Junction, Ia.
Det., Bay City & Alpena R. R. 3-2 g. 48 m. 5 lo. 227 c.
Milo Eastman, *Supt* .... East Tawas, Mich.
Det., Lansing & No'n R. R. 4-8½ g. 222 m. 84 lo. 1027 c
John B. Mulliken, *Gen. Man*...... Detroit, Mich.
Allan Bourn, *Pur. Agt*............ Detroit, Mich.
Thos. M. Fish, *Gen. Supt*........... Ionia, Mich.
G. C. Watrous, *M. M. & C. B* ...... Ionia, Mich.
Det., Mack. & Marq. R.R. 4-8½ g. 152 m. 16 lo. 1,112 c.
D. McCool, *Gen. Supt*... ..... Marquette, Mich.
W. J. Tench, *Pur. Agt*........ Marquette, Mich.
John B. Wilson, *Mech. Supt*.... Marquette, Mich.
Dorchester & Delaware R.R. (*See Penna. (4) Del. Div.*)
Dubuque & Dakota R. R. 4-8½ g. 64 m. 2 lo. 54 cars.
A. C. Goodrich, *Supt*.............. Hampton, Ia.
W. S. Couch, *Pur. Agt*...... ..... Dubuque, Ia.
Duck River Valley R. R. (*See Nash., Chat. & St. L.*)
Dunkirk, Allegheny Valley & Pittsburgh R. R.
4-8½ g. 91 m. 14 lo. 102 cars.
D. Thayer, *Gen. Supt*............ Dunkirk, N. Y.
R. C. Moore, *Pur. Agt*...... . New York, N. Y.
J. C. Haggett *M. M. & C. B*..... Dunkirk, N. Y.

E

East Alabama Ry. 5 g. 22 m. 3 lo. 19 cars.
W. W. Barnes, *Supt*.............. Opelika, Ala.
East Broad Top R. R. 3 g. 30 m. 7 lo. 260 cars.
A. W. Sims, *Supt* .... Orbisonia, Pa.
A. W. Greenwood, *M. M*.... .... Orbisonia, Pa.
East St Louis & Carondelet Ry. 4-9 g. 4 lo. 27 c.
Joseph Hill, *Gen. Supt*...... East St. Louis, Ill.
East Tenn. & Western North Car. R. R.
3 g. 34 m 3 lo. 73 cars.
Thomas E. Matson, *Supt* . Elizabethton, Tenn.
East Tennessee, Virginia & Georgia R. R.
5 g. 1,453 m. 166 lo. 3,670 cars.
Henry Fink, *Rec* .... Knoxville, Tenn
C. H. Hudson, *Gen. Man*...... Knoxville, Tenn.
J. F. O'Brien, *Asst. Gen. Man*. Knoxville, Tenn.
J. E. Wilcox, *Pur. Agt* ...... Knoxville, Tenn.
East Tenn. Div. and No. Car. and Ohio Branches.
F. K. Huger, *Supt*........... Knoxville, Tenn.
B. J. Sitton, *M. M*..... . .... Knoxville, Tenn.
Jos. Armbruster, *M. C. B*... Knoxville, Tenn.
Alabama Div.: J. M. Bridges, *Supt*... Selma, Ala.
Simon Gay, *M. M* ... . Selma, Ala.
W. W. Pierce, *M. C. B*. .... Selma, Ala.
Memphis & Charleston R. R. (Div.):
R. B. Pegram, Jr., *Supt*..... Memphis, Tenn
H. N. Burford, *M. M*... ...... Memphis, Tenn
Georgia Div.: J. W. Fry, *Supt*...... Atlanta, Ga.
J. E. Mallory, *Ass't Supt*..... .... Macon, Ga.
W. A. Walden, *M. M*........ .... Atlanta, Ga.
J. H. Perkins, *M. C. B*. .... Atlanta, Ga.

East & West R. R. of Ala. 3 g. 110 m. 9 lo. 85 c.
T. J. Nicholl, *Manager*......... Cedartown, Ga.
C. F. West, *M. M. & C. B*... Cedartown, Ga.
Eastern R. R. 4-8½ g. 283 m. 110 lo. 2,268 cars.
Payson Tucker, *Gen. Man*........ Boston, Mass.
D. W. Sanborn, *Mast. of Trans*.. Boston, Mass.
G. F. Hurd, *Pur. Agt*....... . .. Boston, Mass.
Amos Pilsbury, *S. M. P. & M*. .. E. Boston, Mass.
A. M. Waitt, *G. For. Car Dept*.... Salem, Mass.
Con'y Div.: J. W. Sanborn, *Supt*., Wolfboro J., N.H.
Eastern Kentucky R. R. 4-8½ g. 34 m. 5 lo. 160 c.
H. W. Bates, *Man. & Pur. Agt*... Riverton, Ky.
H. W. Crawford, *M. M*.......... Hunnewell, Ky.
Eastern (Maine) R. R. (*See Maine Central.*)
Eastern Shore R. R. 4-8½ g. 38 m. 3 lo. 9 c.
W. Thompson, *Supt*........ Princess Anne, Md.
F. Strattner, *M. M*......... Princess Anne, Md.
Elmira, Cortland & Northern R. R. 4-8½ g
A. A. McLeod, *Gen. Man*......... Elmira, N. Y.
Edw. Mahler, *Pur. Agt*.......... Elmira, N.Y.
Thos Kearsley, *M.M. & M. C.B.* Cortland, N.Y.
Erie & Huron Ry. 4-8½ g. 40 m.
E. O. Bickford, *Gen Man* .... Toronto, Ont.
Erie & Pittsburg R. R. (*See Penna. Co.; (3) Div.*)
Etowah & Deaton's R. R. 3 g. 9 m.
D. M. Rogers, *Gen. Man*............ Etowah, Ga.
Eureka Springs Ry. 4-8½ g. 19 m. 1 lo. 9 cars.
Powell Clayton, *Gen. Man*. Eureka Springs, Ark.
Eureka & Palisade R. R. 3 g. 97 m. 7 lo. 125 cars.
B. Gilman, *Gen. Supt & Pur. Agt*.. Eureka, Nev.
J. M. Crawford, *M. M*.............. Palisade, Nev.
A. S. Longley, *M. C. B*....... ... Palisade, Nev.
European & North American R. R. (*See Maine Cen.*)
Evansville, Rockport & E'n Ry. 4-9 g. 71 m. 5 lo. 98 c.
H. L. Shepard, *Supt*............ Evansville, Ind.
Evansv. & Terre Haute. 4-8½ g. 169 m. 26 lo. 973 c.
D. J. Mackey, *Gen. Supt*...... Evansville, Ind.
John Torrance, *M. M*.... ...... Evansville, Ind.

F

Fitchburg R. R. 4-8½ g. 152 m. 100 lo. 3,566 cars.
John Adams, *Gen. Supt*........... Boston, Mass.
F. S. Pratt, *Pur. Agt* .... Boston, Mass.
Orlando Stewart, *Supt. M. P*...... Boston, Mass.
J. W. Marden, *Supt. C. Dept*. Charlestown, Mass.
Flint & Pere Marq. 4-8½ g. 346 m. 78 lo. 2,664 cars.
H. C. Potter, *Gen. Man*..... E. Saginaw, Mich.
D. Edwards, *Asst. Gen. Man*.. E. Saginaw, Mich
G. G. Cook, *Pur. Agt*......... E. Saginaw, Mich.
Sanford Keeler, *Gen. Supt*.. E. Saginaw, Mich.
W. F. Potter, *Supt*. (E. Div.).. E. Saginaw, Mich
W. F. Potter, *Supt*. (W. Div.).. E. Saginaw, Mich.
T. J. Hatswell, *M. M* .... . E. Saginaw, Mich.
H. M. Perry, *M. C. B* .... E. Saginaw, Mich.
Florida Ry. & Nav. Co. 5 g. 488 m. 31 lo. 397 c.
D. E. Maxwell, *Gen. Supt*.... Fernandina, Fla.
R. V. Dohoney, *M. M. & C. B* Fernandina, Fla.
Florida Southern Ry. 3 g. 159 m. 17 lo. 155 cars.
Sherman Conant, *Gen. Man* .. ... Palatka, Fla.
Jas. D. Hollister, *Supt. & P. Agt*.. Palatka, Fla.
St. J. & L. Eustis Div.: 50 m.
W. J. Jarvis, *Supt* .... Ft. Mason, Fla.
W. B. Denham, *Asst. Supt*... Ft. Mason, Fla.
W. M. Rutherford, *M. M*..... Ft. Mason, Fla.
Fonda, Johnst'n & Gloversv. 4-8½ g. 26 m. 5 lo. 35 c.
Lawton Caten, *Supt*.. ...... Gloversville, N. Y.
G. V. Putman, *M. M*....... Gloversville, N. Y.
Fond du Lac, Amboy & Peoria. 3 g. 30 m. 2 lo. 35 c.
Alonzo Kinyon, *Supt. & P. A*. Fond du Lac, Wis.
Fort Dodge & Fort Ridley R. R. (*See Minn. & St. L.*)
Franklin & Prov. & Hopkinton. 22 m.
E. T. Logee, *Supt* .... Milford, Mass.
Ft. Madison & No.-West'n Ry. 3 g. 45 m. 4 lo. 121 c.
S. B. Kenrick, *Rec. & Pur. Agt*. Ft. Madison, Ia
I. L. Lamb, *M. M. & C. B*..... Ft. Madison, Ia.
Ft. Wayne, Cin. & Louisv. 4-8½ g. 128 m. 10 lo. 250 c.
White Water R. R. 4-8½ g. 65 m. 5 lo. 170 cars.
W. W. Worthington, *Gen. Supt*... Ft. Wayne, Ind.
T. H. Haberkorn, *M. M*......... Ft. Wayne, Ind.
Wm. Knight, *M. C. B*.......... Ft. Wayne, Ind.
Ft. Worth & Denver City Ry. 4-8½ g. 114 m. 8 lo. 443 c.
C. L. Frost, *Gen. Supt* ...... Fort Worth, Tex.
Freehold & New York Ry. 4-8½ g. 15 m. 4 lo. 40 c.
J. E. Ralph, *Supt. & Pur. Agt*. Freehold, N. J.
M. C. Mooney, *M. M*..... .... Freehold, N. J.
C. H. Snedeker, *M. C. B*...... Freehold, N. J.
Fulton County N. G. Ry. 3 g. 61 m. 4 lo. 168 cars.
A. C. Atherton, *Gen. Supt. & P. Agt*. Lewiston, Ill.

G

Gainesville & Dahlonega R. R. 3 g. 15 m.
W. P. Price, *Pres*............... Dahlonega, Ga.
Gainesville, Jefferson & Southern R.R. (*See Cen. of Ga*)
Gal., Harrisburg & San Antonio Ry. (*See Cen. Pac.*)
Galveston, Houston & Hend. R.R. (*See Mo. Pac. (5) Div.*)
Galveston, Sabine & St. Louis Ry.
4-8½ g. 28 m. 2 lo. 33 cars
Brad. Barner, *Gen. Man*.... .. Longview, Tex.
Chas. H. Jewell, *Gen. Supt*..... Longview, Tex.
Geneva, Ithaca & Sayre R. R. (*See Lehigh Val.*)
George's Creek & Cumberland R. R.
4-9 g. 25 m. 6 lo. 212 cars.
J. A. Millholland, *Gen. Man*.. Cumberland, Md.
Georgetown & Lane's R. R. 5 g. 36 m. 2 lo. 52 c.
G. W. Earle, *Gen. Supt*...... Georgetown, S. C
Georgia R. R. 5 g. 307 m. 42 lo. 1,048 cars.
John W. Green, *Gen. Man*......... Augusta, Ga.
John S. Cook, *M. M*............... Augusta, Ga.
T. M. Preval, *M. C. B*.... .... Augusta, Ga.
Georgia Pacific Ry. 5 g. 218 m.
I. Y. Sage, *Gen. Supt*........ Birmingham, Ala.
S. H. Purcell, *Div. Supt*....... Greenville, Miss.
G. H. Barnum, *Div. Supt*... .. Columbus, Miss.
Gettysburg & Harrisburg R. R. 4-9 g. 21 m.
W. H. Woodward, *Supt*. Pine Grove Furnace, Pa.
G'd Rap., Newaygo & L. S. R. R. (*See Chic. & W. M.*)
Grand Rapids & Indiana. 4-9 g. 528 m. 56 lo. 2,083 c.
W. O. Hughart, *Gen. Man*. Grand Rapids, Mich.
W. R. Shelby, *Pur. Agt*.... Grand Rapids, Mich.
S. D. Bradley, *M. M*...... Grand Rapids, Mich.
No'n Div.: J. M. Metheany, *Supt*. G'nd Rap., Mich.
So'n Div.: P. S. O'Rourke, *Supt*. Fort Wayne, Ind.
Grand Southern Ry. of New Brunswick.
4-8½ g. 82 m. 5 lo. 54 cars.
J. N. Greene, *Gen. Man*..... . St. George, N. B.
F. W. Holt, *Supt*............. St. George, N. B.
Thomas Logan, *M. M*...... . St. George, N. B.
Grand Tower & Carbondale. 4-8½ g. 25 m. 6 lo. 357 c.
J. C. Simpson, *Supt*.......... Carbondale, Ill.
Hugh Smith, *M. M*....... .... Murphysboro, Ill.
O. L. Garrison, *Pur. Agt* ...... St. Louis, Mo
Grand Trunk Ry. 4-8½ g. 2,332 m. 660 lo. 16,330 c.
Joseph Hickson, *Gen. Man* ... Montreal, Can.
Wm. Wainright, *Asst. Gen. Man*. Montreal, Can.
Jno. Taylor, *Gen. Storekeeper*... Montreal, Can.
Herbert Wallis, *Mech. Supt*..... Montreal, Can.
Wm. McWood, *Supt. Car Dept*... Montreal, Can.
J. Harkom, *Ass. Mech. Supt*.. Richmond, P. Q.
A. H. Smith, *Ass. Mech. Supt*.... Toronto, Ont.
R. Boaz, *Asst. Mech. Supt* ... Stratford, Ont.
F. L. Wanklyn, *Loco. Works*... Montreal, Can.
Gt. West'n Div.: Chas. Stiff, *Supt*. Hamilton, Ont.
E. Baines, *Store Kpr*....... .. London, Ont.
C. K. Domville, *Mech. Supt*... Hamilton, Ont.
E. Mavor, *Asst Mch. Supt* .. Hamilton, Ont.
J. D. McIlwain, *Asst. Car Dept*. London, Ont.
Chi. & Gr. Trunk Ry. 4-8½ g. 339 m. 103 lo. 1,191 c.
W. J. Spicer, *Gen. Man*..... Detroit, Mich.
A. B. Atwater, *Supt*. .... Battle Creek, Mich.
J. F. Lorimer, *Storekeeper*..... Detroit, Mich
H. Roberts, *Mech. Supt*........ Detroit, Mich.
Midland of Can. 4-8½ g. 471 m. 44 lo. 1,423 c.
W. B. Ferguson, *Supt* .... Peterboro, Ont.
J. D. Barnet, *Mech. Supt*... Port Hope, Ont.
Det., Gr. H. & Mil. Ry. 4-8½ g. 189 m. 39 lo. 696 c.
W. J. Spicer, *Gen. Man*... .... Detroit, Mich.
John S. Lorimer, *Storekeeper*.... Detroit, Mich.
W. J. Morgan, *Supt*...... ...... Detroit, Mich.
H. Roberts, *Mech. Supt*..... Port Huron, Mich.
Green Bay, Winona & St. Paul R. R.
4-8½ g. 250 m. 19 lo. 623 cars.
G. Campbell, *Gen. Man*.. *& P. A*. Green Bay, Wis.
A. Fenwick, *M. M*........... Ft. Howard, Wis.
Green Cove Spring & Melrose R.R. 3 g. 32 m. 1 lo. 11 c.
S. Ackley, *Pres*..... .... Philadelphia, Pa.

Greenwood, Laurens & Spart'g. 5 g. 4 lo.
J. N. Bass, *Supt* .... Augusta, Ga.
T. F. Warwick, *M. M. & M. C. B*.. Augusta, Ga.
Greenwich & Johnsonville Ry. 4-8½ g. 15 m. 1 lo. 7 c.
J. H. Thompson, *Supt* ... ... Greenwich, N. Y.
Gulf, Col. & Santa Fé Ry. 4-8½ g. 536 m. 51 lo. 1,400 c.
Webster Snyder, *Gen. Man*.. Galveston, Texas.
Jno. W. Thorne, *Pur. Agt*.... Galveston, Texas.
W. H. Reilly, *M. M. & M. C. B*. Galveston, Texas.
Gulf, W'n Texas & Pac. Ry. 4-8½ g. 68 m. 6 lo. 74 c.
M. D. Monserrate, *Supt. & Pur. Agt*. Cuero, Tex.
James Mooney *M. M*....... .. Cuero, Texas.

H

Hannibal & St. Jo. R. R. 4-8½ g. 292 m. 76 lo. 1,906 c.
J. F. Barnard, *Gen. Man* ...... St. Joseph, Mo.
S. E. Cranco, *Gen. Supt* ... . Hannibal, Mo.
Wm. Irving, *Pur. Agt*... .... Chicago, Ill
N. J. Paradise, *Supt. M. M*.. .... Hannibal, Mo.
G. M. Shryock, *M. C. B*.......... Hannibal, Mo.
Hanover Branch R. R. 4-8½ g. 8 m. 2 lo. 18 cars.
E. Y. Perry, *Supt*........ South Hanover, Mass.
Hanover Junction, Hanover & Gettysburg R. R.
4-8½ g. 74 m. 10 lo. 140 cars.
H. D. Scott, *Gen. Supt*.......... Gettysburg, Pa.
John J. Bingley *M. M*.......... Hanover, Pa.
Jas. Harthorn, *M. C. B*....... ... Hanover, Pa.
Harrisburg & Potomac R. R. 4-8½ g. 41 m. 3 lo. 45 c.
R. H. Middleton, *Supt*...... Boiling Springs, Pa.
Hartford & Conn. Val. R. R. 4-8½ g. 47 m. 9 lo. 196 c.
O. M. Shepard, *Supt*.... ..... New Haven, Ct.
John Henry, Jr., *Supt. M. P*. Hartford, Conn.
Hartford & Conn. W'n R.R. 4-8½ g. 110 m. 16 lo. 495 c.
Edw. McNeil, *Supt*........ .. . Hartford, Ct.
J. C. Barton, *M. M*................ Hartford, Ct.
Hecla & Torch Lake R. R. 4-1 g. 5 m. 5 lo. 165 cars.
W. A. Childs, *Gen. Man*......... Calumet, Mich.
Herkimer, Newport & Poland Ry.
3-6 g. 17 m. 2 lo. 24 cars.
Albert Wilber, *Supt*........... Herkimer, N. Y.
Hobart & Manistee River R. R. 3 g. 9 m. 2 lo. 42 c.
H. W. Marsh, *Supt*. .... Hobart, Mich.
Hot Springs R. R. 3 g. 25 m. 3 lo. 39 cars.
J. N. Conger, *Supt*... .... Hot Springs, Ark.
L. Finlay, *M. M*................... Malvern, Ark.
Housatonic R. R. 4-8½ g. 126 m. 23 lo. 879 cars.
W. H. Yeomans, *Supt*.......... Bridgeport, Ct.
D. S. Draper, *Pur. Agt*.......... Bridgeport, Ct.
N. Slingland, *M. M*.... ...... Falls Village, Ct.
J. J. Ferris, *M. C. B*....... ... Falls Village, Ct.
Houston Belt Ry. 4-8½ and 3 gauge 16 miles.
S. L. Werden, *V. P. & Gen. Man*. Houston, Tex.
Houston, East & West Tex. Ry. 3 g. 150 m. 10 lo. 570 c.
Paul Bremond, *Pr. & Pur. Agt*.. Houston, Tex.
E. L. Bremond, *Gen. Man*........ Houston, Tex.
Ed. Campbell, *M. M*............. Houston, Tex.
C. F. Schelewa, *M. C. B*. ...... Houston, Texas.
Houston & Tex. Cen. Ry. 4-8½ g. 750 m. 78 lo. 2,526 c.
J. Waldo, *V. Pr. & Gen. Man*.... Houston, Tex.
A. H. Swanson, *Gen. Tr. Man*..... Houston, Tex.
L. C. Noble, *Gen. M. M*........... Houston, Tex.
James McGee, *M. C. B*.. .... Houston, Tex.
So. & Wn. Divs.: M. G. Howe, *Supt*. Houston, Tex.
No. & Mi. Divs.: G. A. Quinlan, *Supt*., and
C. H. Burns, *Asst. M. M*...... Corsicana, Tex.
No.-Wn. Div.: Donald Allen, *Supt*.... Waco, Tex.
Humeston & Shenandoah R. R.
4-8½ g. 113 m. 18 lo. 80 cars.
E. C. Murphy, *Gen. Man*...... ... Clarinda, Ia.
M. B. Snyder, *M. M* .... Shenandoah, Ia.
Huntingdon & Br. Top Mt. 4-8½ g. 65 m. 18 lo. 318 c.
Geo. F. Gage, *Gen. Man*. ... Huntingdon, Pa.
Samuel B. Knight, *Pur. Agt*.. Philadelphia, Pa.
William Barkla *M. M*...... ..... Saxton Pa.

I

Illinois Central R. R. 4-8½ g. 1,928 m. 334 lo. 8,565 c.
E. T. Jeffery, *Gen. Supt* .... Chicago, Ill.
O. Ott, *Pur. Agt*...... .... Chicago, Ill
Henry Schlacks, *Supt. of Mach*.... Chicago, Ill.
W. B. Snow, *M. M. Car Works*..... Chicago, Ill
(1) Ill. & Ia. Divs.: C. A. Beck, *Supt*..... Chicago,
Chic. Div.: T. J. Hudson, *Supt* . ... Cairo, Ill.
Wm. Renshaw, *M. M* .... Chicago, Ill.
Mid. Div.: H. L. Frisbie, *Supt*.. .... . Pontiac, Ill.
Spring. Div.: W. Wilkinson, *Supt*. Springfield, Ill.
Wm. Griffin, *M. M* .... Clinton, Ill.
No'n Div.: J. C. Jacobs, *Supt*.......... Amboy, Ill.
J. B. Edams, *M. M*........... ... Amboy, Ill.
Ia. Div.: M. Gilleas, *Supt*....... ... Dubuque, Ia.
Thos. W. Place, *M. M*........ . Waterloo, Ia.
(2) So. Divs.: C. M. Sheafe, *Supt*.... New Orleans, La.
La. Div.: J. M. Turner, *Supt*. McComb City, Miss.
W. B. McKenna, *M. M*... McComb City, Miss.
Miss. Div.: J. G. Mann, *Supt*...... Jackson, Tenn.
J. F. White, *M. M*....... Water Valley, Miss.
Illinois Midland Ry. 4-8½ g. 176 m. 12 lo. 611 cars.
D. H. Conklin, *Rec. & Gen. Man*...... Decatur, Ill.
O. E. Grady, *Train Mast*.......... Decatur, Ill.
Frank Young, *For. Shops*............ Paris, Ill.
Illinois & St. Louis R. R. 4-8½ g. 19 m. 10 lo. 450 c
C. H. Sharman, *Gen. Supt. & P. A*. St. Louis, Mo
D. J. Timlin, *M. M*... .... Belleville, Ill.
Charles Rothe, *M. C. B*..... .. E. St. Louis Ill
Indiana, Bloomington & Western Ry.
4-8¾ g. 826 m. 108 lo. 4,018 cars.
C. E. Henderson, *Gen. Man*. Indianapolis, Ind.
I. H. Wilson, *Gen. Supt* ..... Indianapolis, Ind.
H. C. Norton, *Pur. Agt*...... Indianapolis, Ind.
Jos. S. Porter, *Div. M. M*........ . Sandusky, O.
E. Hiserodt, *Gen. M. M*....... Indianapolis, Ind.
M. Fogarty, *Div. M. M* .... Urbana, Ill.
W. B. Warren, *Div. M. M* ... Indianapolis, Ind.
Indiana, Illinois & Iowa R.R. 4-8½ g. 104 m. 5 lo. 83 c.
F. M. Drake, *Pres*.......... ... Kankakee, Ill.
T. P. Shonts, *Gen. Supt*...... ... Kankakee, Ill.
R. C. Ackley, *M. M*............... Kankakee, Ill.
Indiana & Illinois Southern Ry. 3 g. 91 m. 3 lo. 69 c.
W. C. Lyon, *Gen. Man. & P. Agt*. Robinson, Ill.
J. S. Pickering, *M. M. & C. B*.. Effingham, Ill.
Indianapolis, Decatur & Springfield Ry.
Geo. Bender, *Supt* ... . Indianapolis, Ind.
M. M.... ...... Indianapolis, Ind.
Indianapolis & Evansville Ry. 4-8½ g. 54 m.
D. J Mackey, *Supt* ... . Evansville, Ind.
Indianapolis & St. Louis R. R. (*See C., C., C. & I.*)
Indianapo. & Vincennes R.R. (*See Penna. Co.; (8) Div.*)
Intercolonial Ry. 4-8½ g. 873 m. 163 lo. 4,589 cars.
David Pottinger, *Chief Supt*..... Moncton, N. B.
T. V. Cook, *Gen. Storekeeper*... Moncton, N. B.
H. A. Whitney, *Mech Supt*...... Moncton, N. B.
Ewd. D. Shaffer, *M. C. B* .... Moncton, N. B.
M. & C. Dist.: J. E. Price, *Supt*. Campbellton, N. B.
Hal. & St. J. Div.: J. J. Wallace, *Supt*.. Truro, N. B.
Q. & St. F. Div.: A. R. McDonald, *Supt*. Riv. du Lp, Q.
International Ry. 4-8½ g. 69 m. 7 lo. 12 cars.
D. E. McFee, *Supt*........... Sherbrooke, P. Q.
J. Ruelle, *M. M*........ .... .. Sherbrooke, P. Q.
W. Charest, *M. C. B*......... Sherbrooke, P. Q.
International & Gt. N'n R. R. (*See Mo. Pac.; (5) Div.*)
Iowa Falls & Sioux City R. R. (*See Ill. Cen.*)
Iron Mountain & Helena R. R. (*See Mo. Pac.; (4) Div.*)
Ithaca, Auburn & Western Ry. (*See Southern Cen.*)

J

Jacksonville So.-E'n R. R. 4-8½ g. 54 m. 5 lo. 69 c.
E. S. Greenleaf, *Supt*.......... Jacksonville, Ill.
Ira F. Petrie, *M. M*............ Jacksonville, Ill.
Jacksonville, St. Augustine & Halifax River Ry.
3 g. 76 m. 3 lo. 27 cars
W. L. Crawford, *Gen. Man*.. Jacksonville, Fla.
E. T. Silvius, *M. M*. .... Jacksonville, Fla.
Jacksonv., Pensacola & Mob. (*See Fla. Cent. & W.*)
Jacksonville, Tampa & Key West Ry. 5 g. 56 m.
G. W. Bentley, *Gen. Man*. .. Jacksonville, Fla.
M. R. Moran, *Supt*.......... . Jacksonville, Fla.
F. B. Hurlbut, *M. C. B*..... Jacksonville, Fla.
Jamesville & Washington R. R. (*See Norfolk So'n.*)
Jeffersonv'l, Madison & Indpls. R. R. (*See (9) Pa. Co.*)
Jersey City & Albany R. R. 4-8½ g. 38 m.
J. W. McCulloh, *Manager* ... Jersey City, N. J.
Jersey City & Bergen R. R. 4-10 g. 21 m. 2 lo. 13 c.
T. M. Sayre, *Supt*.... .... Jersey City, N. J.
Jersey Shore, Pine Creek & Buff. Ry. (*See Phil. & R.*)
Junction & Breakwater R.R. (*See Del., Md. & Va.*

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COVINGTON, KENTUCKY,

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AND STEEL WIRE BRADS,
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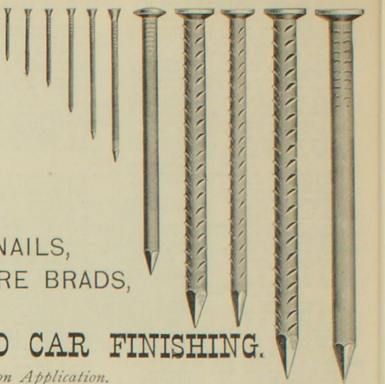

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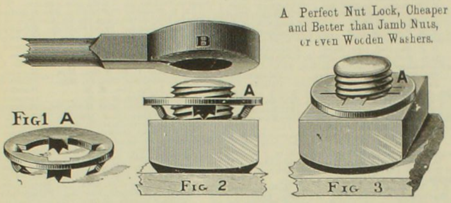

Fig. 1.—*A* represents nut lock detached. Fig. 2.—*A*, nut lock in position, ready to apply; *B*, the tool used in setting the lock—it is simply a bar of iron having a hole ⅛ inch larger than the bolt—when placed as indicated one or two smart blows with a hammer on the tool force the lock flat, the teeth entering the metal of the bolt. Fig 3.—*A* represents the lock applied.

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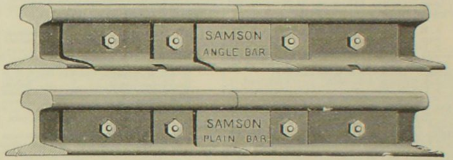
MORRIS SELLERS & CO., Sole Proprietors and Manufacturers of the Celebrated "SAMSON" BAR



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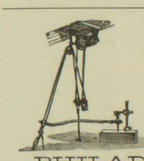

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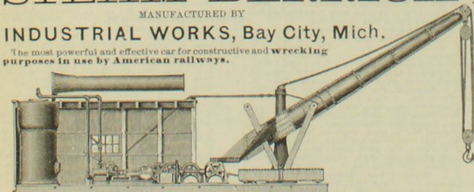

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K

Kaaterskill R. R. 3 g. 8 m.
J. H. Jones, *Supt*..... ....Rondout, N. Y.
Kansas Central R. R. (*See Union Pacific.*
Kansas City, Fort Scott & Gulf R. R.
4-8½ g. 389 m. 75 l. 2,037 c.
Geo. H. Nettleton, *Gen. Man*..Kansas City, Mo.
L. W. Towne, *Supt*..... ......Kansas City, Mo.
H. P. Jacques, *Pur. Agt*..... Kansas City, Mo.
J. S. McCrum, *M. M* ....Kansas City, Mo.
A. N. Montier, *M. C. B*.... ....Kansas City, Mo.
Kansas Cy, Lawrence & So. Kan. (*See At., Top. & S. F.*)
Kansas City, Springfield & Memphis R. R.
4-8½ g. 283 m. 10 lo. 456 cars.
George H. Nettleton, *Pres*....Kansas City, Mo.
L. W. Towne, *Supt*............Kansas City, Mo.
H. P. Jacques, *Pur. Agt*.......Kansas City, Mo.
J. S. McCrum, *M. M*......... ..Kansas City, Mo.
A. N. Montier, *M. C. B*........Kansas City, Mo.
Kansas City, St. Joseph & Council Bluffs; and St. Jo. & Des Moines R. Rs. 4-8½ & 3 g. 368 m. 41 lo. 1,148 c.
J. F. Barnard, *Gen. Man*.........St. Joseph, Mo.
J. R. Hardy, *Supt*. .... St. Joseph, Mo.
D. H. Winton, *Asst. Supt*......St. Joseph, Mo.
A. B. Barnard, *Asst. Supt*....Kansas City, Mo
Wm. Irving, *Pur. Agt* .. ..Chicago, Ill.
F. A. Chase, *M. M* .. .. St. Joseph, Mo
Thos. Aylesbury, *J. For. Car. Dep.* St. Joseph, Mo
Kansas City & Southern Ry. 4-8½ g. In progress.
Wm. Bailey, *Pres*............Kansas City, Mo.
Kansas Coal Belt R. R. 4-8½ g. In progress.
C. H. Malin, *Gen. Man*.... ....Girard, Kan.
F. A. Hill, *Supt*.................Girard, Kan.
Kansas & Gulf Short Line R. R. 33 m. 2 lo. 32 cars.
Gen. Man..........Tyler, Tex.
V. K. Stevenson, *Pur. Agt*.....New York, N. Y.
Kent Northern Ry. 4-8½ g. 27 m. 2 lo. 16 cars.
J. C. Brown, *Gen. Man*. ....Richibucto, N. B.
Kentucky Central R. R. 4-9 g. 255 m. 28 lo. 640 cars.
H. E. Huntington, *Supt*....... .Covington, Ky.
W. T. Smith, *M. of Mach*.......Covington, Ky.
Kentucky & South Atlantic Ry. 3 g. 23 m. 3 lo. 52 c.
Geo. B. Harper, *Supt. & P. A*..Mt. Sterling, Ky
Geo. W. Lewis, *M. M*..... .....Mt. Sterling, Ky.
Keokuk & Des Moines R. R. (*See Chi., R. I. & Pac.*)
Kingston & Pembroke Ry. 4-8½ g. 104 m. 9 lo. 214 c.
B. W. Folger, *Supt*..... ....Kingston, Ont.
J. H. Taylor, *Pur. Agt*..........Kingston, Ont.
J. H. Taylor, *M. M* ... .Kingston, Ont.
Knox & Lincoln R. R. 4-8½ g. 49 m. 6 lo. 119 cars.
C. A. Coombs, *Supt*.................Bath, Me.
Wm. A. Field, *M. M*........ ...... Bath, Me.
C. L. Turner, *M. C. B*..... ....Bath, Me.
Knoxville & Augusta R. R. 5 g. 16 m. 2 lo. 34 cars.
R. N. Hood, *Gen. Man. & P. Agt*. Knoxville, Tenn
J. M. Hood, *Supt*... ....Knoxville, Tenn.

L

Lackawanna & Pittsburgh R. R. 3 g. 97 m.
Geo. W. Chapman, *Rec*.........Angelica, N. Y.
Lake Champlain & Moriah R. R. 4-8½ g. 8 m. 8 lo. 222c.
E. B. Hedding, *Supt*.... ...Port Henry, N. Y.
Lake Erie & Western Ry. 4-8½ g. 388 m. 53 lo. 1,701 c.
J. H. Cheney, *Gen. Man*..... Bloomington, Ill.
D. S. Hill, *Gen. Supt*.........Bloomington, Ill.
T. H. Perry, *Pur. Agt*.........Bloomington, Ill.
H. L. Cooper, *Supt. of Equipment*....Lima, O.
Lake George & Muskegon River R. R.
4-8½ g. 20 m. 4 lo. 79 cars.
W. S. Gerrish, *Gen. Man*... Muskegon, Mich.
Lake Shore & Michigan So'n Ry.
4-8½ g. 1,340 m. 547 lo. 17,115 cars.
John Newell, *Pres*.............. Cleveland, O.
P. P. Wright, *Gen. Supt*..... ....Cleveland, O.
L. G. Higgins, *Pur. Agt*...........Cleveland, O.
G. W. Stevens, *Supt. M. P*........Cleveland, O.
John Kirby, *Gen. M. C. B*..........Cleveland, O.
East'n Div.: C. B. Couch, *Supt*.....Cleveland, O.
J. S. Graham, *M. M*............ Buffalo, N. Y.
A. C. Robson, *M. C. B*..........Buffalo, N. Y.
L. O. Gassett, *M. M*... ....Cleveland, O.
J. Withycombe, *M. C. B*.. .....Cleveland, O.
Frank. Div.: G. H. McIntire, *Supt*. Youngstown, O.
Toledo Div.: Thos. Flesher, Jr., *Supt*. Cleveland, O.
J. M. Sanborn, *M. M*........ .....Norwalk, O.
W. O. Smith, *M. C. B*........ .. Norwalk, O.
Mich. Divs.: J. E. Curtis, *Supt*......... Toledo, O.
Det. Brs.: T. J. Charlesworth, *Supt*. Detroit, Mich.
Lansing, Ypsilanti & Ft. Wayne Branches.
W. H. Caniff, *Supt*............Hillsdale, Mich.
Western Div.: A. G. Amsden, *Supt*...Chicago, Ill.
W. L. Gilmore, *M. M*............Elkhart, Ind.
Frank O. Bray, *M. C. B*.........Adrian, Mich.
Gr. Rap. Br.: M. E. Wattles, *Supt*. Kalamazoo, Mich.
Lake Tahoe R. R. 3 g. 10 m. 3 lo. 49 cars..
D. L. Bliss, *Gen. Man* ....Carson, Nev.
John T. Rogers, *Gen. Supt*...... Carson, Nev
Tho. Morris, *M. M*..............Carson, Nev.
Leavenworth, Topeka & So. W'n Ry. (*See A. T. & S. F.*)
Lebanon Springs R. R. 4-8½ g. 58 m. 5 lo. 44 c.
W. C. Alstyne, *Gen. Man*... ....Albany, N. Y.
W. H. Hawkins, *Pur. Agt* ....Albany, N. Y.
Geo. Tefft, *M. M*...............Chatham, N. Y.
Lehigh Valley R. R. 4-8½ g. 495 m. 392 lo. 36,998 c.
H. S. Goodwin, *Gen. Supt*.......Bethlehem, Pa.
W. C. Alderson, *Pur. Agt*.....Philadelphia, Pa.
John I. Kinsey, *M. M*.............So. Easton, Pa.
John S. Lentz, *M. C. B*.. ... ...Packerton, Pa.
N. J. Div.: Jas. Donnelly, *Supt*. Perth Amboy, N. J.
Coal Rds.: J. I. Blakeslee, *Supt*. Mauch Chunk, Pa.
D. Clark, *M. M*.. ....Hazleton, Pa.
John Campbell, *M. M*...............Delano, Pa.
B. M. Div.: A. G. Brodhead, *S*..Mauch Chunk, Pa.
P. Hofecker, *M. M*.......... .....Weatherly, Pa.
Wy. Div.: A. Mitchell, *S. & M. M*. Wilkesbarre, Pa.
Pa. & N. Y.; and Geneva, Ithaca & Sayre R. Rs.
Wm. Stevenson, *Gen. Supt* ....Sayre, Pa.
J. N. Weaver, *M. M* .... Sayre, Pa.
Jno. S. Lentz, *M. C. B* .... Packerton, Pa.
Lehigh & Hudson River Ry. 4-8½ g. 63 m. 8 lo. 350 c.
Grinnell Burt, *Gen Man*........Warwick, N. Y
N. L. Furman, *Supt* ....Warwick, N. Y.
John Sayre, *Pur. Agt*.........Warwick, N. Y.
S. Mills, *M. M*..... ....Warwick, N. Y.
Lehigh & Lackawanna and Lehigh & Susquehanna R. Rs. (*See Phil. & Read.; N. J. Cen. Div.*)
Levis & Kennebec R. R. (*See Quebec Cen.*)
Litchfield, Carrollton & Western R. R. 4-8½ g. 22 m.
H. S. Carroll, *Prest. & G. Man*..Carrollton, Ill.
Ligonier Valley R. R. 4-9 g. 11 m. 2 lo. 22 cars.
Thos. A. Mellon, *Gen. Manager*..Pittsburgh, Pa.
Geo. Senft, *Supt. & P. Agt*........Latrobe, Pa.
Little Miami R. R. (*See Penna. Co.'s Rds.; (8) Div.*)
Little Rock, Miss. River & Texas Ry.
4-8½ g. 170 m. 12 lo. 299 cars.
H. Wood, *Gen Man*. .. ...Little Rock, Ark.
F. A. Lister, *Gen. Supt*........Little Rock Ark.
F. Hufsmith, *M. M. & C. B*. .....Argenta, Ark.
Little Rock & Fort Smith. 4-8½ g. 170 m. 13 lo. 360 c
Hy. Wood, *Gen. Man*... .....Little Rock, Ark
F. A. Lister, *Supt*... ....Little Rock, Ark.
F. Hufsmith, *M. M. & M. C. B*.....Argenta, Ark
Little Saw Mill Run R. R. 3 & 4-8½ g. 8 m. 4 lo. 327 c.
T. Hartley, *Gen. Man*..........Banksville, Pa.
Long Island R. R. 4-8½ g. 352 m. 92 lo. 953 cars.
I. D. Barton, *Gen. Supt*..Long Island City, N. Y
Benj. Norton, *Pur. Agt*..Long Island City, N. Y.
C. A. Thompson, *M. M*. Long Island City, N. Y.
Longview & Sabine Valley R. R. (*See Gal. Sab. & St. L.*)
Louisiana W'n R. R. (*See Cen. Pac.; G., H. & S. A. Div.*)
Louisville, Cin. & Lexington R. R. (*See Louis. & N.*)
Louis., Evans. & St. L. Ry. 4-8½ g. 254 m. 24 lo. 1,032c.
Geo. F. Evans, *Rec* ....Louisville, Ky.
R. S. Minor, *Gen. Supt*........Louisville, Ky.
F. P. Boatman, *M. M*........... Evansville, Ind.
Louisville, New Albany & Chicago Ry.
4-8½ g. 479 miles 60 lo. 3,700 cars.
John B. Carson, *Gen. Man* .....Chicago, Ill
W. R. Woodard, *Gen. Supt*.... ...Chicago, Ill.
H. O. Nourse, *Pur. Agt* ....Chicago, Ill.
Josiah Bettis, *M. M* .... .New Albany, Ind.
Chas. Coller, *M. C. B*. ....New Albany, Ind.
C. C. F. Bent, *Supt. Trans*......Lafayette, Ind.
Louisville, New Orleans & Tex. Ry. 455 m. In progress.
Jas. M. Edwards, *Gen. Man*.. .Memphis, Tenn.
M. Burke, *Gen. Supt* ... .Memphis, Tenn.
John Bradley, *Asst. Supt*.....New Orleans, La.
A. M. Cooke, *Pur. Agt*....... .Memphis, Tenn.
E. D. Anderson, *M. M* .. ..Vicksburg, Miss.
J. J. Casey, *M. C. B*..........Vicksburg, Miss.
Louisville & Nashville R. R.
5 g. 2,186 m. 380 lo. 12,197 cars.
Reuben Wells, *Gen. Man*........Louisville, Ky.
J. T. Harahan, *Asst Gen. M*....Louisville, Ky.
Geo. F. Evans, *Supt* ....Louisville, Ky.
P. P. Huston, *Pur. Agt*........ .Louisville, Ky.
Harvey Middleton, *Supt. Mach*..Louisville, Ky.
Louisv., Cin. & Lex. Divs.;
J. G. Metcalf, *Supt. Trans*..... Louisville, Ky.
P. Leeds, *M. M*....... ....Louisville, Ky.
J. W. Luttrell, *M. M* ....Louisville, Ky.
J. G. Clifford, *M. M.* (2d & C. Div.). Bowling Grn. Ky.
Henderson Div.: J. Geddes, *Supt*. Henderson, Ky.
W. P. Pike, *M. M*....... ......Nashville, Tenn.
Nash. & D. Div.: J. Geddes, *Supt*. Nashville, Tenn.
Elkton & Guthrie:
J. Geddes, *Supt*.... ...... Nashville, Tenn.
S. & N. A. Div.: Levi Hedge, *Supt*. Birmingham, Ala.
C. W. White, *M. M*........Birmingham, Ala.
Mob. & M.; N. Div. Pens. & Sel.; Sl. & Mont. R. Rs.:
B. C. Epperson, *Supt*... ...Montgomery, Ala.
J. N. Hall, *M. M.* (Mont. Shops). Montgomery, Ala.
N. O. Div.: O. M. Dunn, *Supt*...New Orleans, La.
Wm. Adair, *M. M*............. .....Mobile, Ala.
Memp. Div.: W. Colcamp, *Supt*. Memphis, Tenn.
J. V. Slusser, *M. M*............. Memphis, Tenn.
St. L. Div.: C. O. Parker, *Supt*. Montgomery, Ala.
Thos. Walsh, *M. M*... ....Mt. Vernon, Ill.
Pensacola and So. Div. Pens. & Selma and P. & A. Rds.:
E. O. Saltmarsh, *Supt*..........Pensacola, Fla.
W. D. Robb, *M. M*...............Pensacola, Fla.
Louisville & Wadley R. R. 5 g. 10 m. 1 lo. 5 c.
J. H. Wilkins, *Supt. & Pur. Agt*. Louisville, Ga.

M

Macon & Brunswick R. R.
(*See E. Tenn., Vir. & Ga.; At. & Ga. Divs.*)
Maine Central R. R. 4-8½ g. 525 m. 82 lo. 2,168 c.
Payson Tucker, *Gen. Man*........Portland, Me.
Amos Pillsbury, *M. M*...... ....Waterville, Me.
C. H. Kenison, *M. C. B*....... ....Augusta, Me.
Eastern Maine. 3 g. 19 m. 2 lo. 40 c.
L. L. Lincoln, *Supt*... ....Portland, Me.
Manchester & Keene R. R. 4-8½ g. 30 m. (*See Concord.*)
Manchester & Lawrence R. R. (*See Concord.*)
Manchester & North Weare R. R. (*See Concord.*)
Manhattan Ry. 4-8½ g. 32 m. 228 lo. 652 pass. c.
Frank K. Hain, *Gen. Man*.....New York, N. Y.
W. T. Goundie, *Supt. Trans*. .New York, N. Y.
T. W. Peeples, *M. M*...... ....New York, N. Y.
H. A. Webster, *M. C. B*........New York, N. Y.
Manitoba Southwestern Colonization Ry.
4-8½ g. 52 m. 3 lo. 125 cars.
J. M. Eagan, *V. Pres*...........Winnipeg, Man.
W. T. Reed, *M. M*.............Winnipeg, Man.
Marietta & Cincinnati R. R. (*See Cin. Wash. & Balt.*)
Marietta & North Georgia R. R. 3 g. 70 m. 4 lo. 45 c.
J. B. Glover, *Gen. Man*...... .. ..Marietta, Ga.
W. R. Power, *Pur. Agt* ....Marietta, Ga.
C. Chester, *M. M*.......... ......Marietta, Ga.
Marquette, Houghton & Ontonagon R. R.
4-8½ g. 100 m. 42 lo. 2,530 cars.
John Hornby, *Gen. Man*.......Marquette, Mich.
W. A. Thompson, *Ass't Supt*. Marquette, Mich.
M. B. McGee, *Pur. Agt* ......Marquette, Mich.
W. A. Mahan, *M. M*... ....Marquette, Mich.
H. D. Lyons, *M. C. B*. . ...Marquette, Mich.
Maryland Central R. R. 3 g. 27 m. 4 lo. 56 cars.
S. G. Boyd, *Supt*..,. ....Baltimore, Md.
Marquette & Western. 4-8½ g. 25 m. 10 l. 500 c.
D. McCool, *Gen. Supt*........Marquette, Mich.
W. J. Tench, *Pur. Agt*..... .Marquette, Mich.
J. B. Wilson, *Mech. Supt*......Marquette, Mich.
Massachusetts Central R. R. 4-8½ g. 48 m. 5 l. 81 c.
E. G. Allen, *Supt. & Pur. Agt*....Boston, Mass.
E. A. Walker, *M. M*.... ....So. Sudbury, Mass.
Memphis & Charleston R. R. (*See E. Tenn. Va. & Ga.*.
Memphis & Lit. Rock R. R. 5 g. 135 m. 14 lo. 299 c.
R. Fink, *G. Man. & P. A*......Little Rock, Ark.
H. G. Fleming, *Supt*......... ..Memphis, Tenn.
Thos. Rennell, *M. M* ....Argenta, Ark.
T. Rennell, *M. C. B* ....Argenta, Ark.
Mexican Ry. 4-8½ g. 293 m. 42 lo. 616 cars.
E. W. Jackson, *Gen. Man*... ....Mexico, Mex.
Mexican Central Ry. 4-8½ g. 1,224 m. 94 lo. 2,609 c.
Theo. Nickerson, *Pur. Agt*......Boston, Mass.
E. W. Jackson, *Gen. Man*...El Paso del Norte.
D. MacKenzie, *Gen. Supt* .....City of Mexico.
F. W. Johnstone, *Supt. M. P. & M*. City of Mexico.
J. H. O'Brien, *M. M* .. ..City of Mexico.
G. T. Jarvis, *Div Supt*.........City of Mexico.
A. Smith, *Div. Supt*. ... .Silao, Mex.
I. A. Eacutt, *Div. Supt* .. .... Jimulco, Mex.
R. E. Comfort, *Div. Supt*..Paso del Norte, Mex.
R. S. Simpson, *M. M* ....City of Mexico.
A. Hendee, *M. M*... ....Calera, Mex.
C. F. Stewart, *M. M*.... ....Silao, Mex.
W. L. Wallace, *M. M*..............Jimulco, Mex.
J. G. McCuen, *M. M* ....Chihuahua, Mex.
Tampico Div: E. A. Whorf, *Supt*. Tampico, Mex.
San Blas Div.: C. E. Payne, *Supt*..San Blas, Mex.
Mexican National Ry. 3 g. 766 m. 50 lo. 1,283 c.
Northern General Division:
D. C. Dodge, *V. P. & Gen. Man*...Laredo, Tex
C. A. Merriam, *Gen. Supt*.......Laredo, Tex.
F. W. Baldwin, *Asst. Gen. Supt*..Laredo, Tex.
John Grace, *M. M* ... .Laredo, Tex.
T. Milan, *M. M*............Corpus Christi, Tex.
Metamoras, Div.:
W. W. Mayberry, *Asst. Supt*..Brownsville, Tex.
Galveston Div.:
T. E. Quinn, *Asst. Supt* ... ..Galveston, Tex.
Southern General Division:
W. E. Lewis, *Supt*.......... ..Mexico, Mex.
R. C. Peebles, *Asst. Supt* ....Mexico, Mex.
J. M. Winslow, *M. M*...........Mexico, Mex.
Zacatecas Div.:
C. Langrand, *Manager*........Zacatecas, Mex.
Michigan Cen. R. R. 4-8½ g. 1,485 m. 357 lo. 11,284 c.
H. B. Ledyard, *Pres. & Gen. Man*. Detroit, Mich.
E. C. Brown, *Gen. Supt* ....Detroit, Mich.
Robert Miller, *Asst. Gen. Supt*...Detroit, Mich.
Allan Bourn, *Pur. Agt*... ....Detroit, Mich.
C. E. Smart, *Gen. M. M*........ .Jackson, Mich.
(1) Lines West of Detroit River:
E. C. Brown, *Gen. Supt*........Detroit, Mich.
East. Div.: D. S. Sutherland, *Supt*. Detroit, Mich.
Bay City, Saginaw & Mackinaw Divisions.:
W. A. Vaughan, *Supt*.........Bay City, Mich.
C. E. Smart, *M. M*............Bay City, Mich.
Main Line: Gr. Rap.; So. Bend; and So. Hav. Divs.:
C. B. Bush, *Supt*... .... Jackson, Mich.
W'n Divs.: R. H. L'Hommedieu, *Supt*. Chicago, Ill.
(2) Lines East of Detroit River:
J. B. Morford, *Supt*,. ....St. Thomas, Ont.
A. F. Bull, *M. M* ....St. Thomas, Ont.
Rob't Potts, *M. C. B*.. ...St. Thomas, Ont.
Michigan & Ohio.
L. A. Latcha, *Gen. Man*.............Toledo, O.
W. L. Webb, *Pur. Agt*....... .....Toledo, O.
D. J. Durrell, *M. M* . ... Marshall, Mich.
Middleburg & Schoharie: and Schoharie Valley R. Rs. 4-8½ g. 11 m. 2 lo. 6 cars.
P. S. Danforth, *Gen. Supt*... Middleburg, N. Y.
Midland of Canada. (*See Grand Trunk.*)
Midland No. Carolina Ry. 5 g. 95 m. 9 lo. 82 cars.
Atlantic & North Carolina Ry. 22 m.
John D. Whitford, *Gen. Man*..Newbern, N. C.
J. A. Bryan, *Supt*...............Newbern, N. C
D. J. Sprague, *Pur. Agt*..... .New York, N. Y.
B. Manly, *Supt. of Mach*....... Newbern, N. C.
Milford & Woonsocket.
W. W. Jencks, *Supt*........... Milford, Mass.
Milton & Sutherlin. (*Oper. by Rich. & Danville.*)
Milwaukee, Lake Shore & Western Ry.
4-8½ g. 370 m. 45 lo. 1,536 cars.
H. G. H. Reed, *Gen. Supt*.... .Milwaukee, Wis
J. Donahue, *Supt* ....Milwaukee, Wis.
John Hickey, *M. M*. ... .Ledyard, Wis.
Milwaukee & Northern and Wisconsin & Michigan R. Rds. 4-8½ g. 228 m. 24 l. 703 cars.
C. F. Dutton, *Gen. Supt*.......Milwaukee, Wis.
N. S. Kimball, *M. M*.......... Ft. Howard, Wis.
Mineral Range R. R. 3 g. 13 m. 4 lo. 43 cars
Chas. E. Holland, *Pr. & Supt*...Hancock, Mich.
W. H. Carr, *Pur. Agt*... ....Hancock, Mich.
T. J. Shellhorn, *M. M. & C. B*. Hancock, Mich.
Minneapolis, Lyndale & Minnetonka Ry.
3 g. 25 miles 4 motors 1 lo. 35 cars.
William McCrory, *Man*.....Minneapolis, Minn.
T. W. Heintzelman, *M. M*. Minneapolis, Minn.
Minneapolis, S. Ste. Marie & Atlantic Ry.
4-8½ g. 45 m.
W. W. Rich, *Supt*..........Minneapolis, Minn.
Minneapolis & St. Louis Ry.
4-8½ g. 560 m. 72 lo. 2,060 c.
W. H. Truesdale, *V. Pres*..Minneapolis, Minn.
T. E. Clarke, *Gen. Supt*...Minneapolis, Minn.
W. B. Palmer, *Pur. Agent*. Minneapolis, Minn.
G. F. Wilson, *M. M. & M. C. B*. Minneapolis, Minn
Missisquoi R. R. 4-8 g. 28 m.
W. C. Smith, *Man* ... .St. Albans, Vt.
Mississippi, Terre aux Bœufs & Lake R. R.
29 miles.
M. R. Spelman, *Supt*.. ....New Orleans, La.
Mississippi & Tenn. R. R. 4-8½ g. 101 m. 12 lo. 194 c.
Jas. M. Edwards, *Gen. Man*....Memphis, Tenn.
J. C. Ramsey, *M. M* ....Memphis, Tenn.
S. J. Bolton, *M. C. B*...........Memphis, Tenn.
Missouri, Iowa & Nebraska R. R. 4-8½ g. 143 m.
H. T. Clark, *Supt* ... .Alexandria, Mo.
Missouri, Kansas & Texas Ry. (*See Mo. Pac.; (2) Div.*)
Missouri Pacific Ry. (Leased and operated lines.)
4-8½ g. 6,029 m. 697 lo. 19,748 cars.
H. M. Hoxie, *3d V. Pres*.. ....St. Louis, Mo.
R. B. Lyle, *Pur. Agt*..... ....St. Louis, Mo.
(1), (2) and (3) Divs.:
John Hodge, *Supt. Car Dep*.......St. Louis, Mo.
Frank Howard, *Asst. Supt. C. D*...Marshall, Tex.
(4), (5) and (6) Divs.:
O. A. Haynes, *Insp. L. C. & M*...St. Louis, Mo.
(1) Missouri Pacific Ry. 1,028 m. 155 lo. 4,218 cars.
E. K. Sibley, *Supt*....... ....Sedalia, Mo.
T. W. Newell, *M. M*..............Sedalia, Mo.
E. Taylor, *Asst. M. M*.............Sedalia, Mo.
W'n Div.: A. M. Hagar, *Supt*........Sedalia, Mo.
L. Bartlett, *M. M*......... ..... St. Louis, Mo.
(2) Mo., Kan. & Tex. Ry. 1,308 m. 140 lo. 4,248 cars.
Jos. Herrin, *Supt* ....Sedalia, Mo.
S. Irvin, *Asst. Supt. Car Dep*...... Sedalia, Mo.
E. K. Sibley, *Supt*. ....Parsons, Kan.
W. E. Phillips, *M. M* .. ..Parsons Kan.
(3) Central Branch Un. Pac. R. R. 388 m. 30 lo. 599 c.
W. W. Fagan, *Supt*............Atchison, Kan.
B. V. Faries, *M. M*..... ....Atchison, Kan.
J. W. Blackburn, *A. Supt. Car D*..Atchison, Kan.
(4) St. L., I. Mt. & So'n Ry. 905 m. 138 lo. 4,928 c.
Wm. Kerrigan, *Supt* .. ..St. Louis, Mo.
St. Louis Div.: W. H. Harris, *M. M*..De Soto, Mo.
Ark. Div.: *Supt*..... ..Little Rock, Ark.
R. M. Richardson, *M. M*.....Little Rock, Ark.
(5) Int. & G. No.: *Supt*..Palestine, Tex.
M. M....... ....Palestine, Tex.
(6) Tex. & Pac: Warder Cumming, *Supt*. Marshall, Tex.
E. N. O. & Tr. Cont. Divs.:
Geo. Dimick, *Supt*............Marshall, Tex.
J. K. Lape, *M. M*...............Marshall, Tex.
E. R. Smith, *M. M. & M. C. B*..N. Orleans, La.
Rio Grande Div.:
L. L. Keller, *Supt*...........Big Springs, Tex.
J. K. Lape, *M. M* .... Big Springs, Tex.
Mobile & Ala. Grand Trunk R. R. 5 g. 59 m. 2 lo. 23 c.
Wm. H. Pratt, *Trustee*..............Mobile, Ala.
Mobile & Girard R. R. 5 g. 84 m. 7 lo. 112 cars
W. L. Clark, *Gen. Supt*..........Columbus, Ga.
J. C. Albrecht, *M. M*.... ....Columbus, Ga.
A. J. Nix, *M. C. B*................Columbus, Ga.
Mobile & Montgomery Ry. (*See Louis. & Nash.*)
Mobile & Northwestern R. R. 3 g. 31 m. 2 lo. 16 c.
Thomas T. A. Lyon, *Pres*.......Glendale, Miss.
Mobile & Ohio R. R. 5 g. 528 m. 75 lo. 1,353 cars.
T. M. R. Talcott, *V. Pr. & Gen. Man*. Mobile, Ala.
J. G. Motley, *Gen. Supt*...........Mobile, Ala.
F. Jordan, *Pur. Agt*.. ....Mobile, Ala.
M. T. Carson, *Gen. M. M*..........Whistler, Ala.
J. T. Booth, *M. C. B*......... . ..Whistler, Ala.
So'n Div.:.......... ....,. Mobile, Ala.
L. J. Morris, *M. M*..... .. ..Macon, Miss.
No'n Div.: E. S. Hosford, *Supt*.. Jackson, Tenn.
H. C. Goode, *M. M*....... ...Jackson, Tenn.
Mobile & Spring Hill R. R. 5-2 g. 8 m. 1 lo. 16 cars.
F. Ingate, *Manager*... ....Mobile, Ala.
Moline & Southeastern R. R. 3-6 g. 8 m. 2 lo. 26 c.
R. Battersly, *Gen. Man*.........Coal Valley, Ill.
Mont Alto R. R. 4-9 g. 21 m. 2 lo. 8 cars.
G. B. Wiestling, *Supt. & P. A*....Mont Alto, Pa.
Montgomery & Eufaula Ry. (*See Cen. of Ga.*)
Montgomery Southern Ry. 3 g. 20 m. 1 lo. 15 cars.
S. D. Hubbard, Jr., *Gen. Man*. Montgomery, Ala.
Montour R. R. 4-8½ g. 12 m. 2 lo. 130 cars.
C. R. Brown, *Supt. & Pur. Agt*...Imperial, Pa.
Henry Newman, *M. C. B*.... ..Imperial, Pa.
Montpelier & Wells Riv. R. R. 4-8½ g. 38 m. 3 lo. 86c.
W. A. Stowell, *Supt*... ....Montpelier, Vt.
Montreal Portland & Boston Ry. (*See Passumpsic.*)
Montreal & Sorel Ry. 4-8½ g. 47 m. 3 lo. 35 c.
C. N. Armstrong, *G. M. & Pur. Agt*. Sorel, P. Q.
J. F. Armstrong, *Gen. Supt*.... ....Sorel, P. Q
G. W. Pangborn, *M. M*... ....Sorel, P. Q.
Montrose Ry. 3 g. 28 m. 3 lo. 24 cars.
T. G. Walter, *Gen. Supt*... Tunkhannock, Pa.
Morgan's Louis. & Tex. R. R. 4-8½ g. 260 m. 46 l. 1,339 c.
J. Kruttschnitt, *Supt*.........New Orleans, La.
C. Trumpy, *Pur. Agt*..... . New Orleans, La.
J. D. Connell, *M. M*...... .. ..Algiers, La.
Jno. Hildebrand, *M. C. B*..... .. Algiers, La.
Mount Washington R. R. 5-3 g. 3 m. 6 lo. 6 cars.
Walter Aiken, *Gen. Man*........Franklin, N. H.

N

Nantasket Beach R. R. 4-8½ g. 6 m. 5 lo. 25 c.
George L. Keyes, *Gen. Supt*......Boston, Mass.
Naugatuck R. R. 4-8½ g. 62 m. 17 lo. 547 cars.
Geo. W. Beach, *Supt* ....Waterbury, Conn.
H. A. Bishop, *Pur. Agt*... ..Bridgeport, Conn.
H'y D. Beach, *Supt. R. S*....Bridgeport, Conn.
Napanee, Tamworth & Quebec Ry. In progress.
Ed. W. Rathbun, *Gen. Man*....Deseronto, Ont
R. C. Carter, *Asst. Gen. Man*..Deseronto, Ont.
Narragansett Pier R. R. 4-8½ g. 8 m. 2 lo. 11 c.
G. T. Lanphear, *Supt. & Pur. Agt*. Peacedale, R. I.
Nashua & Rochester R. R. (*See Wor. & Nash.*)
Nashville, Chattanooga & St. Louis Ry.
5 g. 539 miles 87 lo. 1,979 cars.
J. W. Thomas, *G. Man. & P. Agt*. Nashville, Tenn.
M. J. C. Wrenne, *Supt*.. . ...Nashville, Tenn.
James Cullen, *M. M. & C. B*...Nashville, Tenn.
Nashville & Florence R. R. 5 g. 51 m.
J. Geddes, *Supt*....... ......Columbia, Tenn.
Natchez, Jackson & Col. R. R. 3-6 g. 100 m. 7 lo. 92 c.
E. D. Frost, *Gen. Supt*..... ... Natchez, Miss.
Nebraska, Topeka, Iola & Memphis R. R. 4-8½ g. 16 m.
H. M. Clarke, *Gen. Man*.... ......Girard, Kan.
C. H. Malin, *Gen. Supt* ....Girard, Kan.
New Brunswick Ry. 4-8½ g. 419 m. 20 lo. 357 cars.
F. W. Cram, *Gen. Man*... ...Woodstock, N. B.
Jesse Mathews, *M. M*............Gibson, N. B.
T. N. Burpee, *M. C. B*....McAdam Junc., N. B.
J. J. Seely, *Pur. Agt*.........Woodstock, N. B.
Thos. Armstrong, *M. M*.... St. Andrew's, N. B.
G. Houlton, *M. C. B*........St. Andrew's, N. B.
New Brunswick & Can. Ry. (*See New Brun.*)
Newburg, Dutchess & Conn. R. R. 4-8½ g. 58 m.
C. L. Kimball, *Supt. & P. Agt*. Matteawan, N. Y.
New Castle R. R. 3-6 g. 5 m. 2 lo. 76 cars.
Geo. Pearson, *Gen. Man*.......New Castle, Pa.
New Castle & Beaver Valley R. R. (*See Penna. Co.*)
New Haven & Derby R. R. 4-8½ g. 13 m. 4 lo. 70 c.
E. S. Quintard, *Supt*. .. ....New Haven, Conn.
J. M. Whitlock, *M. M. & C. B*. New Haven, Conn.
New Haven & No'mpton. 4-8½ g. 170 m. 28 lo. 579 c
S. B. Opdyke, Jr., *Supt*...... ...New Haven, Ct.
R. G. Curtis, *Pur. Agt*.... .... New Haven, Ct.
Henry Fox, *M. M*.... ....New Haven, Ct.
John Sweeny, *For. Car. Shps*...New Haven, Ct.
New Jersey & New York Ry. 4-8½ g. 37 m. 6 lo. 40 c.
J. D. Hasbrouck, *Gen. Man* Jersey City, N. J.
J. S. Drake, *Supt. & M. M*... ...Hillsdale, N. J.
L. B. Van Wagonen, *M. C. B* .... Hillsdale, N. J.
N. J. Southern Ry. (*See Phil. & Read.; N. J. So. Div.*)
New London Northern R. R. (*See Central Ver.*)
New Orleans, B. Rouge, Vicks. & Memphis.
Jas. M. Edwards, *Gen. Man*..New Orleans, La.
John Bradley, *Supt*... ....New Orleans, La.
New Orleans Pacific Ry. (*See Mo. Pac.; (6) Div.*)
New Orleans & Carrollton R. R.
4-8½ g. 15 m. 12 lo. 79 cars.
C. V. Haile, *Supt*............New Orleans, La.
John Dahmer, *M. M*. ....New Orleans, La.
Jas. Thorn, *M. C. B*. ....New Orleans, La.
New Orleans & Mobile R. R. (*See Louis. & Nash.*)
N. O. & Northeastern R. R. (*See Cin., N. O. & Tex. Pac.*)
New Orleans & Selma R. R. 5 g. 21 m. 1 lo. 8 cars.
L. R. Schofield, Supt..............Selma, Ala.
Newport & Wickford R. R. 4-8½ g. 22 m.
Theo. Warren, *Supt*... .. . .Newport, R. I.
Nevada Central R. R.:
C. W. Hinchcliffe, *Rec. & Supt* ...Austin, Nev.
Louis Parisoe, *M. M*.....Battle Mountain, Nev.
J. B. Gilchrist, *Pur. Agt* ... .Austin, Nev.
Nevada County N. G. R. R. 3 g. 23 m. 3 lo. 46 cars.
John F. Kidder, *Supt*.... ....Grass Valley, Cal.
Jas. McCormick, *M. M. & C. B*. Grass Valley, Cal.
Nevada & Oregon R. R. 3 g. 30 m. 25 cars.
D. W. Balch, *Supt*... ... . Reno, Nev.
N. Y. Central & Hudson River R. R.
4-8½ g. 983 m. 676 lo. 25,161 cars.
J. M. Toucey, *Gen. Supt*...... New York, N. Y.
Chas. Reed, *Pur. Agt*........ New York, N. Y.
Wm. Buchanan, *Supt. M. P. and R. Stock*, New York, N. Y.
N. Y. & Har. Div.: C. M. Bissell, *Supt*. do.
P. McQ. Gibson, *M. M* .... .New York, N. Y.
Hud. Riv. Div.: C. M. Bissell, *Supt*. N. York, N. Y.
W. H. Wolfrath, *M. C. B*....New York, N. Y.
E'n Div.: Zenas C. Priest, *Supt*. Ltle Falls, N. Y.
John Ortton, *M. M*..... ..West Albany, N. Y.
L. Packard, *M. C. B*......West Albany, N. Y.
W'n Div.: Geo. H. Burrows, *Supt*...Buffalo, N. Y.
S. L. White, *M. M*......... ..Syracuse, N. Y.
Amos Gould, *M. M*.... .. .E. Buffalo, N. Y.
E. Chamberlain, *M. C. B*... E. Buffalo, N. Y.
Peter Smith, *M. C. B*..... E. Rochester, N. Y.
Rd. Donaby, *M. C. B*....Niagara Falls, N. Y
N. Y. Chic. & St. L. Ry. 4-8½ g. 524 m. 108 lo. 7,245 c
Lewis Williams, *Gen. Man*..... . Cleveland, O
M. M. Rogers, *Pur. Agt* ....Cleveland, O.
Jno. Mackenzie, *Supt. M. P*. .....Cleveland, O
Eas'tn Div.: G. H. Kimball, *Supt*.. .Cleveland, O
E. A. Miller, *M. M*.......... .....Conneaut, O
West'n Div.: C. D. Gorham, *Supt*....Chicago, Ill.
W. H. Lewis, *M. M*... ....Bellevue, O
New York City & Northern. 4-8½ g. 58 m. 17 lo. 368 c
Frank S. Gannon, *Gen. Supt*. High Bridge, N. Y.
Thos. Millen, *M. M* ....High Bridge, N. Y.
New York, Lackawanna & W'n Ry. (*See Del. L. & W.*)
New York, Lake Erie & Western R. R.
S. M. Felton, Jr., *V. Pr*...... New York, N. Y.
(1) N. Y., L. E. & W. Div.: 4-8½ g. 1,073 m. 576 lo. 30,553 c.
B. Thomas, *Gen. Supt*........Jersey City, N. J.
W. G. Tuller, *Pur. Agt*........New York, N. Y.
F. M. Wilder, *Supt. M. P. & M*...Susqueh'a, Pa.
E'n Div.: E. O. Hill, *Supt*......Jersey City, N. J.
J. H. Vreeland, *M. M*...... Jersey City, N. J.
J. N. Mileham, *M. C. B*.....Jersey City, N. J.
Del. Div.: E. Van Etten, *Supt*..Port Jervis, N. Y.
J. Van Vechten, *M. M. & C. B*. Pt. Jervis, N. Y.
Susq. Div.: R. B. Cable, *Act. Supt*..Elmira, N. Y.
V. Blackburn, *M. M*.... ...Susquehanna, Pa
D. B. Goodell, *M. C. B*... ....Elmira, N. Y
Buf. & R. Divs.: W. J. Murphy, *Supt*.; and
Wm. Litz, *M. M*.................Buffalo, N. Y.
M. Wilder, *M. C. B*.............Buffalo, N. Y.
B. & S.-W. Div.: C. A. Brunn, *Supt*. do.
W'n Div.: W. B. Coffin, *Supt*..Hornellsville, N. Y.
J. Hawthorne, *M. M*......Hornellsville, N. Y.
N. Y. & Greenwood L. Ry. 4-8½ g. 44 m. 8 lo. 53 c.
Stephen Smith, *Supt*..........Jersey City N. J.
F. A. Stinard, *M. M*. . ...Pompton, N. J.
(2) N. Y., Pa & O. Div: 4-8½ g. 565 m. 221 lo. 7,794 c.
Chas. Paine, *Gen. Supt*..... ..Cleveland, Ohio.
J. H. Holway, *Pur. Agt*.... ..Cleveland, Ohio.
Wm. Fuller, *Supt. M. P*....... ..Cleveland, O.
S. V. Smith, *Asst. Gen. M. C. B*. ...Kent, Ohio.
E'n Div.: A. L. Dunbar, *Supt*......Meadville, Pa.
J. A. Cooper, *M. M*... ...... .Meadville, Pa.
D. S. Dockstader, *M. C. Rep*...Meadville, Pa.
W'n Div.: A. M. Tucker, *Supt*... ..... Galion, O.
Wm Hill, *M. M*... .. ..Galion, O.
Geo. Wilson, *For. Car Rep*.... .Galion, Ohio.
Maho'g Div.: N. F. Wood, *Supt*. .... .Cleveland, O.
N. Wright, *M. M*. . .. .Cleveland, O.
C. N. Thorp, *M. C. Rep* .... ..Cleveland, O
New York, New Haven & Hartford R. R.
4-8½ g. 203 m. 123 lo. 2,768 cars.
E. M. Reed, *V. P. & Gen. Supt*. New Haven, Ct.
R. N. Dowd, *Pur. Agt*......... .New Haven, Ct.
John Henney, Jr., *Supt. M. P*. .New Haven, Ct.
N. Y. & N. H. Div.: W. H. Stevenson, *Supt*... N. Y.
Shore Line and Air Line Divs.:
W. A. Waterbury, *Supt*.....New Haven, Ct.
Jas. Denver, *M. C. B*..........New Haven, Ct.
Hart. Div.: C. S. Davidson, *Supt*....Hartford, Ct
O. C. Lackey, *M. M* ....Hartford, Ct
Jno. Whitmore, *For. C. Dept*...Hartford, Ct.
N. Y., Ontario & Western Ry. (*See N. Y., W. Sh. & Buf.*)
N. Y., Pittsb'h & Chicago. 4-8½ g. 20 m. 2 lo. 32 c.
Geo. W. Dixon, *Supt*.... ....New Galilee, Pa.
H. T. Hanna, *Pur. Agt* ....Pittsburgh, Pa.
N. Y., Pennsylvania & Ohio R. R. (*See N. Y., L. E. & W.*)
New York, Philadelphia & Norfolk R. R.
4-8½ g. 10 m. 1 lo. 4 cars.
H. W. Dunne, *Supt*..........Cape Charles, Va.
New York, Providence & Boston R. R.
4-8½ g. 83 m. 29 lo. 430 cars.
J. B. Gardner, *Supt*.. ......Providence, R. I.
J. L. Hayden, *Pur. Agt*......Stonington, Conn.
Geo. H. Griggs *M. M. & C. B*..Providence, R. I.
N. Y., Susqueh'na & W'n. 4-9 g. 147 m. 33 lo. 1,469 c.
F. A. Potts, *Gen. Man*......... New York, N. Y.
C. D. McKelvey, *Supt*.........Jersey City, N. J.
C. T. Demarest, *Pur. Agt*.....New York, N. Y.
W. C. Ennis, *M. M. & C. B*...Wortendyke, N. J.
New York, Texas & Mexican Ry.
4-8½ g. 92 m. 6 lo. 95 cars.
Allen McCoy, *Gen. Man*.... ....Victoria, Tex.
J. G. Conlon, *M. M*...............Victoria, Tex
New York, West Shore & Buffalo.
4-8½ g. 850 m. 177 lo. 7,291 c.
J. D. Layng, *Gen. Man*.......New York, N. Y.
C. W. Bradley, *Gen. Supt*..... Weehawken, N. J.
P. S. Bemis, *Pur. Agt* ....New York, N. Y.
R. H. Soule, *Supt. M. P*. ......Frankfort, N. Y.
H. R. Div.: J. P. Bradfield, *Act. Supt*., Weehawken, N. J
Thos. Oldcorn, *M. M*.....New Durham, N. J.
Buff. Div.: D. B. McCoy, *Supt*.....Newark, N. Y.
N. Falls Div.: W. J. Murphy, *Supt*. Buffalo, N. Y.
Coeymans to Newark.
Jas. M. Boon, *M. M*. ....Frankfort, N. Y.
Newark to Buffalo.
Geo. W. West, *M. M*....... East Buffalo, N. Y
New York, Ontario & Western.
J. E. Childs, *Gen. Supt*........New York, N. Y.
N. Y. Woodhaven & Rockaway R. R. (*See Long Is.*)
N. Y. & Greenwood Lake Ry. (*See N. Y., L. E. & W.*)
N. Y. & Manhattan Beach Ry. (*See Long Island.*)
New York & Long Branch R. R. (*See Phil. & Read.*)
New York & New England R. R.
4-8½ g. 473 m. 145 lo. 3,959 cars.
W. H. Turner, *Gen. Supt*..... ... Boston, Mass.
W. W. McKim, *Pur. Agt*...... ...Boston, Mass.
J. B. Henney, *Supt. M. P*....... Boston, Mass.
W. H. Griggs, *M. M*... ......Norwood, Mass.
Elias E. Pratt, *M. C. B*.........Norwood, Mass.
East Div: E. G. Allen, *Supt*........Boston, Mass.
Nor. Div.: P. St. M. Andrews, *Supt*...Norwich, Ct.
M. M ....Norwich, Ct.
Prov. Div.: L. W. Palmer, *Supt*..Providence, R. I.
Hfd. Div.: E. Holbrook, *Supt*.......Hartford, Ct.
E. M. Humstone, *M. M* ....Hartford, Ct.
West'n Div.: C. H. Platt, *Supt*.....Fishkill, N. Y.
Woons'kt Div.:
E. N. Tucker, *Supt*......... Needham, Mass.
New York & Sea Beach R. R. 4-8½ g. 6 m. 6 lo. 41 c.
W. O. McDowell, *Gen. Man*... New York, N. Y.
C. W. Douglass, *Gen. Supt*...Bay Ridge, N. Y.
Newark, Somerset & Straitsville R. R. (*See B. & O.*)
Newburg, Dutchess & Conn. R. R. 4-8½ g. 59 miles.
C. L. Kimball, *Gen. Supt*....Matteawan, N. Y
W. G. Van Buskirk, *M. M. & C. B*., Dutchess Junction, N. Y
Newfoundland Ry. 3-6 g. 45 m. 7 lo. 41 c.
C. X. Hobbs, *Gen. Man*........St. John's, N'f'd

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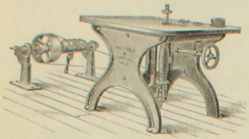
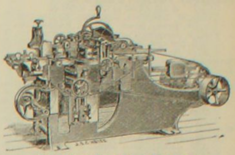


SINGLE SPINDLE UPRIGHT SHAPER.



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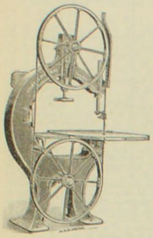
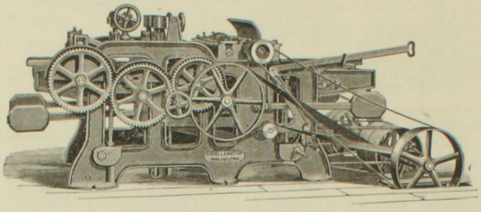


35-INCH BAND SAW.



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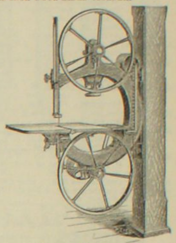
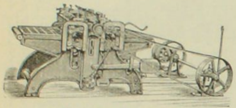


BRACKET BAND SAW.



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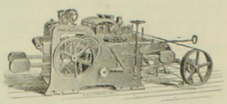

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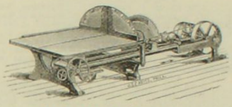

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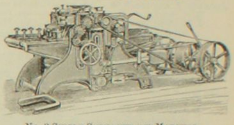

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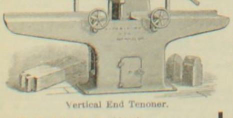

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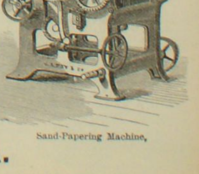

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M. K. King, *Gen. Man. & Pur. Agt.* Norfolk, Va.
J. S. Whitworth, *M. M. & C. B.* .... Norfolk, Va.
Norfolk & Ocean View R. R. & Hotel Co.
3 g. 8 m. 2 lo. 9 cars.
W. H. Taylor, *Pres* .... Norfolk, Va.
Norfolk & Va. Beach R. R. 3 g. 18 m.
J. M. Dickey, *Gen. Man* .... Norfolk, Va.
Norfolk & Western R. R. 5 g. 486 m. 82 lo. 1,779 c.
Jos. H. Sands, *Gen. Supt* ... . Roanoke, Va.
S. B. Haupt, *Supt. M. Power* .... Roanoke, Va.
East Div.: N. M. Osborne, *Supt* ..... Norfolk, Va.
West Div.: Frank Huger, *Supt* .. Lynchburg, Va.
North-Eastern R. R. of Ga. 5 g. 72 m. 2 lo. 20 cars.
H. R. Bernard, *Supt* .... Athens, Ga.
North-Eastern R. R. (S. C.) (*See Wil. & Wel.*
North Pacific Coast R. R. 3 g. 84 m. 12 lo. 320 cars.
Gen. Supt .... San Rafael, Cal.
W. F. Russell, *Pur. Agt* .... San Francisco, Cal.
E. L. Reese, *M. M.* .. .. Saucelito, Cal.
North Shore Ry. 4-8½ g. 209 m. 21 lo. 564 c.
W. Wainwright, *Gen. Man* ..... Montreal, Can.
A. Davis, *Supt. & Pur. Agt* ...... Quebec, Can.
Northern (N. H.), and Concord & Claremont Rys.
(*See Boston & Lowell.*)
Northern (N. J.) R. R. (*See N. Y., L. E. & W'n.*)
Northern Central Ry. (*See Penna. R. R.* (6) *Div.*)
North'n Pacific R. R. 4-8½ g. 2,646 m. 391 lo. 9,897 c.
T. F. Oakes, *Gen. Man* .... St. Paul, Minn.
John H. Ames, *Gen. Pur. Agt* .. St. Paul, Minn.
Geo. W. Cushing, *Supt. M. P., M. & R. S.* do.
J. C. Barber, *M. C. B* .... Brainerd, Minn.
(1) E'n Div.: J. T. Odell, *A. Gen. Man.* St. Paul, Minn.
1st Gr. Div.: M. C. Kimberly, *Supt.* Brainerd, Minn.
H. J. Small, *M. M* .... Brainerd, Minn.
M. C. B ...... Brainerd, Minn.
2d Gr. Div.: J. M. Graham, *Supt.* Jamestown, Dak.
C. C. Quinn, *M. M* .... Fargo, Dak.
A. Bardsley, *M. M* .... Mandan, Dak.
F. Greene, *A. Supt* .... Mandan, Dak.
3d Gr. Div.: S. R. Ainslie, *Supt* .. Glendive, Mont.
S. L. Bean, *M. M* .... Glendive, Mont.
C. W. Rossiter, *M. M.* .... Livingston, Mont.
(2) W'n Div.: J. M. Buckley, *Asst. Gen. Man.*
New Tacoma, W. T.
W. T. Small, *A. S. Mach* .... Tacoma, W. T.
4th Gr. Div.: F. W. Gilbert, *Supt.* Missoula, Mont.
F. P. Weymouth, *Supt* .... Sprague, W. T.
Wm. Garlock, *M. M* .... Missoula, Mont.
J. Evans, *M. M.* .... Sprague, W. T.
5th Gr. Div.: Otis Sprague, *Supt* ... Tacoma, W. T.
Northern & North-W'n Rys. 4-8½ g. 378 m. 50 lo. 1,195 c.
James Webster, *Supt* .... Toronto, Can.
W. C. Schreber, *Pur. Agt.* ...... Allandale, Can.
P. Clarke *M. M* ... . Toronto, Can.
Northern & Western Ry. 4-8½ g. 50 m.
J. B. Snowball, *Man.* .... Chatham, N. B.
Nova Scotia Ry. 4-8½ g. 79 m. 9 lo. 268 c.
C. A. Scott, *Gen. Man* .. ... New Glasgow, N. S.
M. F. Punch, *M. M* .... New Glasgow, N. S.

O

Ogdensburg & Lake Champlain R. R.
4-8½ g. 130 m. 33 lo. 1,694 cars.
A. A. Gaddis, *Gen. Man* ...... Ogdensburg, N. Y.
E. B. Burnham, *Pur. Agt* ... Ogdensburg, N. Y.
Wm. A. Short, *M. M* .... Malone, N. Y.
H. S. Leach, *Master Builder*. Ogdensburg, N. Y.
Ohio River R. R. 4-9 g. 9 lo. 350 cars.
C. L. Williams, *Asst. Supt.* Parkersburg, W. Va.
S. Litchworth, *M. M.* ..... Parkersburg, W. Va.
Ohio Southern R. R.:
W. H. Van Tassel, *Supt* .... Springfield, O.
John King, *M. M* .... Springfield, O.
Ohio & Mississippi Ry. 4-9 g. 616 m. 113 lo. 2,501 cars.
W. W. Peabody, *Pres. & Gen. Man.* Cincinnati, O.
G. E. Atwood, *Pur. Agt* .... Cincinnati, O.
Gen. M. M .... Cincinnati, O.
Cin. Div.: C. B. Cole, *Supt* .... Seymour, Ind.
J. P. Coulter, *Gen. M. C. B* .... .. Aurora, Ind.
E. E. Jenks, *A. Gen. For* ...... Seymour, Ind.
W. L. Hoffecker, *Ass't M. M.* Vincennes, Ind.
A. N. Bradley, *M. C. P.* .... Cochran, Ind.
St. L. & Sp. Div.: C. M. Stanton, *Supt.* St. Louis, Mo.
J. W. Stokes, *M. M.* (Spring. Div.) .. Pana, Ill.
Louisv. Div.: C. B. Cole, *Supt* . . Louisville, Ky.
Old Colony R. R. 4-8½ g. 470 m. 124 lo. 3,027 cars.
J. R. Kendrick, *Gen. Man* .... Boston, Mass.
R. W. Husted, *Pur. Agt* .... Boston, Mass.
Jas. N. Lauder, *Supt. R. S* ...... Boston, Mass.
Sam. Stevens, *S. Br. & Bld'gs* .... Boston, Mass.
Main Li. Div.: J. H. French, *Supt* ... Boston, Mass.
F. M. Twombly, *M. M* .... Boston, Mass.
Cape Cod Div.: C. H. Nye, *Supt* .. Hyannis, Mass.
F. M. Twombly, *M. M* .... Boston, Mass.
No. Div.: S. A. Webber, *Supt* .... Fitchburg, Mass.
A. W. Twombly, *M. M* .... Taunton, Mass.
Olympia & Chehalis Val. R. R. 3 g. 15 m.
Otis Sprague, *Supt* .... Olympia, W. T.
Oregon Ry. & Navigation Co.
3 & 4-8½ g. 807 m. 72 lo. 1,611 cars.
C. H. Prescott, *V. P. & Gen. Man.* Portland, Ore.
F. T. Dodge, *Supt.* (Riv. Div.) .... Portland, Ore.
H. S. Rowe, *Supt.* (Ry Div.) ...... Portland, Ore.
J. M. Drake, *Pur. Agt* .... Portland, Ore.
Goodall, Perkins & Co., *Supt.* (Ocean Div.)
San Francisco, Cal.
C. C. Hobart, *Gen. M. M* ...... The Dalles, Ore.
P. Carlsen, *Foreman* .... The Dalles, Ore.
Oregon & California R. R. 4-8½ g. 449 m. 43 lo. 626 c.
R. Koehler, *Man* .... Portland, Ore.
J. Brandt, *Gen. Supt* .... Portland, Ore.
W. T. Bodley, *Pur. Agt* .... Portland, Ore.
A. Brandt, *M. M* .. .. Portland, Ore.
Ottumwa & Kirkville Ry. 4-8½ g. 13 m.
J. A. Kebler, *Supt* .... Ottumwa, Ia.
Owensboro & Nashville R. R. 5 g. 44 m. 3 lo. 70 c.
W. M. Newbold, *Supt* .... Owensboro, Ky.
J. T. Edwards, *M. M. & C. B.* Owensboro, Ky.
Oxford & Henderson R. R. 4-8½ g. 13 m. 2 lo. 11 c.
James A. White, *Gen. Supt* ... Henderson, N. C.
James E. Lawrence, *M. M* ... Henderson, N. C.

P

Pacific Coast Ry. 3 g. 64 m.
J. M. Fillmore, *Manager*. San Luis Obispo, Cal.
John Walch, *M. M. & C. B.* do.
Painesville & Youngstown Ry. 3 g. 65 m. 7 lo. 319 c.
R. K. Paige, *Rec. & Man* .... Painesville, O.
J. A. Newcome, *Supt. R. S* .... Painesville, O.
Panama R. R. 5 g. 48 m. 14 lo. 2,200 cars.
G. A. Burt, *Gen. Supt* ..... Aspinwall, U. S. Col.
E. Z. Penfield, *Pur. Agt* .... New York, N. Y.
Jos. Beaumont, *M. M* .... Aspinwall, U. S. Col.
Passumpsic R. R. 4-8½ g. 147 m. 28 lo. 1,101 cars.
E. Raymond, *Pres. & Pur. Agt* .. Boston, Mass.
H. E. Folsom, *Supt* .... Lyndonville, Vt.
L. L. Brigham, *M. M* .... Lyndonville, Vt.
L. F. Woodard, *M. C. B* ...... Lyndonville, Vt.
Paw Paw and Toledo & South Haven R. Rds.
3 g. 20 m. 3 lo. 16 cars.
John Ihling, *Supt* .... Lawton, Mich.
Peach Bottom R. R. 3 g. 55 m. 6 lo. 52 cars.
B. B. Newton, *Supt. & Pur. Agt* ... Oxford, Pa.
E. H. Williams, *M. C. B* .... York, Pa.
W. P. Kirk, *M. M* .... Oxford, Pa.
Pemigewasset Valley R. R. 4-8½ g. 21 m. 2 lo. 127c.
J. Thomas Vose, *Pres* .... Boston, Mass.
Pennsylvania Co.'s (5) Roads
4-9 g. 3,222 m. 920 lo. 32,809 cars.
Gen. Divs. (1), (2), (3), (4) and (5).
Wm. A. Baldwin, *Gen. Man* ... Pittsburgh, Pa.
John Thomas, *Gen. Supt* .... Pittsburgh, Pa.
Wm. Mullins, *Gen. Pur. Agt* .... Pittsburgh, Pa.
Joseph Wood, *Supt. M. P* .... . Fort Wayne, Ind.
(1) Pittsburgh, Ft. Wayne & Chicago Ry.
4-9 g. 468 m. 288 lo. 8,023 cars.
E'n Div.: A. B. Starr, *Supt* .... Allegheny, Pa.
Geo. J. Parkin, *M. M* .... Allegheny, Pa.
D. M. Peppard, *M. M* .... Crestline, O.
W'n Div.: C. D. Law, *Supt* ..... Ft. Wayne, Ind.
F. D. Casanave, *M. M* .... Ft. Wayne, Ind.
A. H. Somers, *Gen. For. Shops* ... Chicago, Ill.
(2) Ashtabula & Pittsburgh, and
(3) Erie & Pittsburg R. Rds. 221 m. 29 lo. 1,362 c.
John M. Kimball, *Supt* .. Lawrence Junc., Pa.
J. A. Wood, *Gen. For. Shops* .... Erie, Pa.
(4) Cleveland & Pittsb'g R. R. 225 m. 97 lo. 3,534 c.
R. F. Smith, *Asst. Man* .... Cleveland, O.
Philip Bruner, *Supt* .... Wellsville, O.
W. F. Beardsley, *Mast. of Mach.* Wellsville, O.
(5) No-W'n Ohio Ry.: J. S. Morris, *Supt* ... Toledo, O.
Pennsylvania R. R. Co.'s Roads. (7 Gen. Divs.)
4-9 g. 3,158 m. 1,459 loco. 66,816 cars.
Chas. E. Pugh, *Gen Man* ...... Philadelphia, Pa.
Enoch Lewis, *Pur. Agt* .... Philadelphia, Pa.
S. M. Provost, *Supt. Trans* .. Philadelphia, Pa.
Theo. N. Ely, *Gen. S. M. P.* .... Altoona, Pa.
Pennsylvania R. R. Divs.
4-9 g. 1,213 m. 705 lo. 46,819 cars.
Robt. E. Pettit, *Gen Supt* .... .. Altoona, Pa.
Frank L. Sheppard, *Supt. M. P.* .. Altoona, Pa.
G. W. Strattan, *M. M* .. .. Altoona, Pa.
Jno. P. Levan, *Gen. Fore* .... Altoona, Pa.
Phila. Div.: Tho. Gucker, *Supt.* Philadelphia, Pa.
H. D. Garrett, *M. M* .... W. Philadelphia, Pa.
I. W. Van Houten, *Gen. For* .... W. Phila., Pa.
Schuylkill Div.:
Jas. Reed, *Supt* .... Reading, Pa.
Mid. Div.: O. E. McClellan, *Supt.* Harrisburg, Pa.
E. L. Caum, *M. M* .... Harrisburg, Pa.
Samuel W. Myers, *Gen. For.* Harrisburg, Pa.
Altoona Div.: J. B. Hutchinson, *Supt.* Altoona, Pa.
Pitts. Div.: Robert Pitcairn, *Supt* .. Pittsburgh, Pa.
D. O. Shaver, *M. M* .... Pittsburgh, Pa.
J. G. Stewart, *Gen. For* .... Pittsburgh, Pa.
W. Pa. Div.: A. P. Kirtland, *Supt.* Blairsville, Pa.
Wm. B. Norris, *M. M* .... Blairsville, Pa.
M. H. Fails, *Gen. For* .... Blairsville, Pa.
Fred. Div.: Wilson Brown, *Supt* .... York, Pa.
Tyrone Div.: S. S. Blair, *Supt* .... Tyrone, Pa.
Lew. Div.: Wm. M. Phillips, *Supt.* Lewistown, Pa.
Bed. Div.: R. L. Holliday, *Supt* ..... Bedford, Pa.
Monong. Div.: David M. Watt, *Supt.* Pittsburgh, Pa.
Wm. Lininger, *M. M* .... Ormsby, Pa.
(2) United R. Rs. of N. J. Divs. 471 m. 330 lo. 4,041 c.
F. Wolcott Jackson, *Gen. St.* . Jersey City, N. J.
H. S. Hayward, *Supt. M. P.* .. Jersey City, N. J.
David H. Baker, *Gen. For* ... Jersey City, N. J.
N. Y. Div.: Jos. A. Crawford, *Supt.* Jersey City, N. J.
L. A. Bosdevex, *M. M* . .. Jersey City, N. J.
E. F. Bosdevex, *Gen. For* .. Jersey City, N. J.
Belv. Div.: J. A. Anderson, *Supt.* Lambertv., N. J.
R. McDowell, *M. M* ...... Lambertville, N. J.
Amboy Div: W. N. Bannard, *Supt.* Camden, N. J.
Thos. Kerr, *M. M* .... So. Amboy, N. J.
P. S. Bogart, *Gen. For* ...... So. Amboy, N. J.
(2½) Camden & At. Rd.: 75 m. 18 l. 261 c.
A. G. Dayton, *Supt* .... Camden, N. J.
Rufus Hill, *M. M* .. .. Camden, N. J.
Samuel Wills, *M. C. B* .... Camden, N. J.
(3) West Jersey R. R. 4-9 g, 188 m. 27 lo. 294 cars.
A. G. Dayton, *Gen. Supt* .... Camden, N. J.
W. McAlister, *M. M* .... Camden, N. J.
C. C. Williams, *Gen. For* .... Camden, N. J.
(4) Phila., Wilm. & Balt. R. R. 409 m. 128 lo. 1,882 c.
H. F. Kenney, *Gen. Supt* . .... Philadelphia, Pa.
J. M. Wallis, *S. M. P.* .... Philadelphia, Pa.
H. D. Gordon, *M. M* .... Wilmington, Del.
W. H. Lungren, *M. C. B* .... .. Wilmington, Del.
Cen. Div.: L. K. Lodge, *Supt* .... Media, Pa.
Del. Div.: I. N. Mills, *Supt* .... Clayton, Del.
Md. Div.: H. H. Carter, *Supt* .. Wilmington, Del.
(5) Phila. & Erie R. R. Divs.: 437 m. 110 lo. 3,089 c.
R. Neilson, *Gen. Supt* .... Williamsport, Pa.
Edw. D. Nelson, *Supt. Mo. Po.* Williamsport, Pa.
E'n. Div.: E. B. Westfall, *Supt.* Williamsport, Pa.
Sun. H. & W. Div: A. Walter, *Supt.*; and
H. K. Stout, *M. M* .... Sunbury, Pa.
Mid. Div.: Tho. A. Roberts, *Supt* ..... Renovo, Pa.
Wm. L. Holman, *M. M* .... Renovo, Pa.
West'n Div.: J. W. Reynolds, *Supt* ..... Erie, Pa.
J. Gaskill, *M. M* .... Erie, Pa.
(6) Northern Central Ry. 4-9 g. 346 m. 152 lo. 6,610 c.
Robert Neilson, *Gen. Supt* ... Williamsport, Pa.
Edw. D. Nelson, *Supt. M. P.* .. Williamsport, Pa.
A. W. Sumner, *Pur. Agt* ... . Baltimore, Md.
J. M. Coale, *M. M* .... Baltimore, Md.
G. W. Demarest, *Gen. For* ...... Baltimore, Md.
Susq. Div.: E. B. Westfall, *Supt.* Williamsport, Pa.
Sham. Div.: A. Walter, *Supt* .... Sunbury, Pa.
Elm. & Can. Divs.: S. Meade, *Supt* .. Elmira, N. Y.
Jas. Strode, *M. M* .... Elmira, N. Y.
J. C. Dyott, *Gen. For* .... Elmira, N. Y.
Sodus Bay Div.: S. Mead, *Supt.* Sodus Point, N. Y.
Baltimore Div.: H. W. Kapp, *Supt.* Baltimore, Md.
(7) Balt. & Pot. & Alex. & Fred. 125 m. 30 lo. 360 c.
H. F. Kenny, *Gen. Supt* .... Philadelphia, Pa.
A. W. Sumner, *Pur. Agt* ... . Baltimore, Md.
J. M. Wallis, *Supt. Mo. Po* .... Philadelphia, Pa.
H. D. Gordon, *M. M* .... Wilmington, Del.
J. Lescallett, *For. Mach. Shop*. Washington, D. C.
R. F. Downs, *For. Car Shop* .. Washington, D. C.
Penn. Coal Co.'s R. R. 4-3 g. 67 m. 23 eng. 3,271 c.
J. B. Smith, *Gen. Supt* ..... Dunmore, Pa.
And. Crane, *M. M.* .... Dunmore, Pa.
Geo. W. Simpson, *M. C. B* .... Dunmore, Pa.
Pennsylvania, Slatington & New England R. R.
In progress. 4-8½ g. 18 m. 1 lo. 20 cars.
C. H. Stanton, *Supt* .... New York, N. Y.
Pennsylvania & Erie R. R.—Early Branch.
C. R. Early, *Gen. Supt* .... Ridgeway, Pa.
Pensacola & Atlantic R. R. 5 g. 161 m. 9 lo. 67 cars.
E. O. Saltmarsh, *Gen. Supt* .... Pensacola, Fla.
W. D. Robb, *M. M* .... Pensacola, Fla.
Pensacola & Perdido R. R. 5 g. 10 m. 5 lo. 92 cars.
B. F. Simmons, *Pr. & Supt* .... Pensacola, Fla.
H. W. Simmons, *Pur. Agt* ...... Pensacola, Fla.
J. C. Schutte, *M. M* .... Pensacola, Fla.
People's Ry. 4-8½ g. 15 m. 2 lo. 14 cars.
W. D. Pollard, *Supt* .... Pottsville, Pa.
Peoria, Decatur & Evansville Ry.
4-8½ g. 254 m. 30 lo. 1,660 cars.
G. L. Bradbury, *Gen. Man* .... Peoria, Ill.
P. Reilly, *M. M* .... Mattoon, Ill.
Peoria & Farmington R. R. (*See Cen. Ia.*)
Peoria & Pekin Union Ry. 4-8½ g. 20 m. 12 lo. 106 c.
Thos. B. Burnett, *Gen. Supt. & P. A.* Peoria, Ill.
O. W. Bell, *Supt* .... Peoria, Ill.
R. F. Hurd, *M. M. & C. B* .. .. Peoria, Ill.
Perkiomen R. R. 4-8½ gauge 39 miles
D. B. Clack, *Supt* ..... Perkiomen Junction, Pa.
H. Boyd, *Pur. Agt* .... Norristown, Pa.
Petersburg R. R. 4-8½ g. 64 m. 10 lo. 133 cars.
R. M. Sully, *Supt* .... Petersburg, Va.
Geo. F. Jones, *Pur. Agt* .... Petersburg, Va.
J. R. Woodard, *M. M* .... Petersburg, Va.
Phila., Wilmington & Balt. R. R. (*See Penna. R. R.*)
Peterborough & Hillsborough. (*See Northern, N. H.*)
Philadelphia, Newtown & N. Y. R. R. 4-8½ g. 23 m.
W. M. Geary, *Supt* .... Philadelphia, Pa.
Phila. & Atlantic City R. R. 4-8½ g. 54 m.
John E. Wootten, *Gen. Man.* Philadelphia, Pa.
W. Bertolet, *Supt* .... Philadelphia, Pa.
W. S. Wilson, *Pur. Agt* .... Philadelphia, Pa.
Philadelphia & Erie R. R. (*See Penna. R. R.*; (5) *Div.*)
Philadelphia & Reading R. R.
4-8½ g. 1,588 m. 940 lo. 57,477 cars.
John E. Wootten, *Gen. Man* .. Philadelphia, Pa.
W. S. Wilson, *Pur. Agt* ...... Philadelphia, Pa.
Geo. Eltz, *Supt. Trans* .. .. Reading, Pa.
L. B. Paxson, *Eng. of Mach* ...... Reading, Pa.
No. Penn. & Bound Brook Div.:
I. A. Sweigard, *Supt* .... Philadelphia, Pa.
Mahanoy & Susquehanna Div.:
J. H. Olhausen, *Supt* .... Palo Alto, Pa.
D. C. Reinhart, *Asst. Supt* ... Catawissa, Pa.
A. A. Hesser, *Asst. Supt.* Mahanoy Plane, Pa.
Schuylkill & Susquehanna Br.:
H. W. Tracy, *Supt* .... Pine Grove, Pa.
Reading & Columbia R. R.:
A. M. Wilson, *Supt* .... Columbia, Pa.
N. J. Central and N. J. Southern Divs.:
W. W. Stearns, *Supt* .... .. Elizabeth, N. J.
Lehigh & Susquehanna Div.:
G. W. Twining, *Supt* ... Mauch Chunk, Pa.
Pittsburgh, Bradford & Buffalo Ry. (*See Pitts. & West.*)
Pittsburgh, Chartiers & Youghiogheny R. R.
4-8¾ g. 19 m.
Geo. S. Griscom, *Gen. Man* ..... Pittsburgh, Pa.
Pittsburgh, Cincinnati & St. Louis Ry. (5 Gen. Divs.)
4-9 g. 916 m. 239 lo. 7,133 cars.
James McCrea, *Manager* .... Columbus, O.
Wm. Mullins, *Pur. Agt* .... Pittsburgh, Pa.
Edward B. Wall, *Supt M. P* .... Columbus, O.
(1) P., C. & St. L. Div.: E. B. Taylor, *Supt.* Pittsburgh, Pa.
C. B. Street, *M. M.* .... Dennison, O.
J. M. Copeland, *G. F. Car Shops*. Steubenville, O.
(2) C. & M. V. Div.: W. F. Black *Supt* .. Zanesville, O.
Leroy Kells, *M. M.* .. .. Lancaster, O.
Wm. Meikle, *Gen. For* .... Lancaster, O.
Daniel Jewell, *Gen. F. Car Shops*. Lancaster, O.
(3) Li. Mi. Div.: Ralph Peters, *Supt* .... Cincinnati, O.
Leroy Kells, *M. M* .... Cincinnati, O.
Jos. Underwood, *G. F. Car Shops*. Cincinnati, O.
(4) J. M. & I. R. R.: E. W. McKenna, *Supt.* Louisville, Ky.
Wm. Swanston, *M. M.* .. ... Indianapolis, Ind.
Edw. Austin, *G. F. C. Shops* .. Indianapolis, Ind.
(5) Indianapolis & Vincennes R. R.
J. J. Turner, *Supt* .. .... Indianapolis, Ind.
Pittsburgh, Cleveland & Toledo R. R.
4-8¾ g. 78 m. 18 lo. 525 cars.
C. H. Andrews, *Pres* .... Youngstown, O.
W. F. Hofecker, *M. M* .. ... Youngstown, O.
Pittsburgh, Ft. Wayne & Chicago Ry. (*See Penna. Co.*)
Pittsburgh Southern Ry. (*See Balt. & O.*
Pitts. & Castle Shannon R. R. 3-4 g. 9 m. 5 lo. 428 c.
Gen. Supt ... Pittsburgh, Pa.
Holmes Ward, *M. M* .... Castle Shannon, Pa.
Wm. E. Long, *M. C. B* .... Pittsburgh, Pa.
Pitts. & Lake Erie R. R. 4-8¾ g. 70 m. 30 lo. 1,528 c.
W. C. Quincy, *Gen. Man* .... Pittsburgh, Pa.
D. H. Hostetter *Pur. Agt* .... . Pittsburgh, Pa.
R. W. Jones, *Mast. Trans* ...... Pittsburgh, Pa.
S. W. Haines, *M. M* .... Pittsburgh, Pa.
Pittsburgh, McKeesport & Youghiogheny.
4-8¾ g. 57 m. 19 lo. 278 cars.
W. C. Quincy, *Gen. Man* ...... Pittsburgh, Pa.
R. W. Jones, *M. of Trans* ...... Pittsburgh, Pa.
S. W. Haines, *M. M* .... Pittsburgh, Pa.
Pitts. & Western R. R. 3 & 4-8½ g. 274 m. 50 lo. 1,407 c.
Pitts., Bradford & Buff. Ry. 3 g. 93 m. 8 lo. 163 c.
Tho. M. King, *Gen. Man* .... Allegheny, Pa.
J. T. Johnson, *Supt* .... Allegheny, Pa.
J. Morton Hall, *Pur. Agt* .... Allegheny, Pa.
W. M. Flahavhan, *M. M* .... Allegheny, Pa.
Pontiac, Oxford & Pt. Austin R. R. 100 m.
Geo. W. Debevoise, *Pr. & Gen. Man.* N. York, N. Y.
Jas. Houston, *Gen. Supt* .... Pontiac, Mich.
Port Huron & No.-Western Ry. 3 g. 218 m. 14 lo. 288 c.
H. McMorran, *G. Man. & P. A.* Port Huron, Mich.
I. R. Wadsworth, *Supt* .. ... Port Huron, Mich.
Chas. Diefenbach, *M. M.* .... Port Huron, Mich.
Benj. Hillier, *M. C. B* .... Port Huron, Mich.
Port Jervis & Monticello R. R. 4-8½ g. 24 m. 3 lo. 13 c.
M. V. Heller, *Gen. Man* ...... Port Jervis, N. Y.
Port Royal & Augusta. 5 g. 180 m. 16 lo. 310c.
and Augusta & Knoxville Rys.
J. N. Bass, *Supt* .... Augusta, Ga.
T. F. Warwick, *M. M. & M. C. B.* Augusta, Ga.
Portland & Ogdensburg. 4-8½ g. 110 m. 11 lo. 311 c.
J. Hamilton, *Gen. Supt. & P. A.* .. Portland, Me.
M. M .... Portland, Me.
W. G. Brewer, *M. C. B* .... Portland, Me.
Portland & Rochester R. R. 4-8½ g. 52 m. 8 lo. 226 c.
J. W. Peters, *Supt. & Pur Agt* ... Portland, Me.
E. H. C. Tompson, *For. of Mach* .. Portland, Me.
David Dow, *For. of Car Repairs*. Portland, Me.
Potomac, Fred.'g & Pied. R. R. 3 g. 38 m. 2 lo. 38 c.
W. H. Richards, *Gen. Man.* Fredericksburg, Va.
W. J. Sweigard, *M. M* .... Fredericksburg, Va.
Pough., Hart. & Bos. R. R. 4-8½ g. 45 m. 4 lo. 65 c.
J. A. Perkins, *Supt* .... Poughkeepsie, N. Y.
John L. Donaldson, *M. M.* Poughkeepsie, N. Y.
Pratt Coal & Iron Company's R. R. 5 g. 20 m. 4 lo. 184 c.
W. L. Gude, *Gen. Man* .... Pratt Mines, Ala.
Prescott & Thirty-Fifth Parallel R. R.
4-8½ g. 77 miles in progress.
Samuel A. Henszey, *Gen. Man* .. Prescott, Ariz.
Prince Edward Island Ry. 3-6 g. 220 m. 21 lo. 350 c.
Jas. Coleman, *Supt. & Pur. Agt.*;
Jos. Unsworth, *M. Supt. & Storekeeper*; and
D. M. Fraser, *M. C. B.* .. Charlottetown, P. E. I.
Profile & Franconia Notch R. R. 3 g. 15 m. 3 lo. 18 c.
Emmons Raymond, *Pur. Agt* ... Boston, Mass.
C. H. Greenleaf, *Supt* ..... Profile House, N. H.
Prospect Park & Coney Island R. R.
4-8½ g. 15 m. 8 lo. 123 cars.
And. R. Culver, *Pres* .... Brooklyn, N. Y.
R. Schermerhorn, *Supt* .... Brooklyn, N. Y.
Martin Painter, *M. M* .... Brooklyn, N. Y.
Prov., Warren & Bristol R. R. 4-8½ g. 19 m. 6 lo. 79 c.
Waterman Stone, *Supt* .. .. .. Providence, R. I.
Rufus Smith, *M. M. & C. B* .... Bristol, R. I.
Prov. & Springfield R. R. 4-8½ g. 23 m. 4 lo. 92 c.
Wm. Tinkham, *Gen. Man* ..... Providence, R. I.
G. T. Richardson, *M. M* .... Providence, R. I.
Prov. & Worcester. 4-8½ g. 50 m. 37 lo. 1,253 c.
W. E. Chamberlain, *Supt* ..... Providence, R. I.
A. Griggs, *Supt. L. & C. D* .... Providence, R. I.
Pullman's Palace Car Co. 1,100 passenger cars.
Geo. M. Pullman, *Pres* .... Chicago, Ill.
H. Porter, *V. Pres* .... New York, N. Y.
Geo. F. Brown, *Gen. Man* .... Chicago, Ill.
Wm. A. Angell, *Pur. Agt* .... Chicago, Ill.
S. W. Bretzfield, *Asst. Pur. Agt.* New York, N. Y.
A. Rapp, *Man.* (Chicago Works) .. Chicago, Ill.
H. L. Spaulding, *Man.* (Det Shops). Detroit, Mich.
E. A. Benson, *Supt. Shops* ... ... St. Louis, Mo.

Q

Quebec Central Ry. 4-8½ g. 156 m. 10 lo. 267 cars.
J. R. Woodward, *Gen. Man* .. Sherbrooke, P. Q.
A. Steele, *Supt* .... Sherbrooke, Que.
R. D. Morkill, Jr., *Pur. Agt* .. Sherbrooke, P. Q.
Jas. Seiveright, *M. M* ...... Sherbrooke, P. Q.
Quebec, Montreal, Ottawa & Occidental Ry.
4-8½ g. 354 m. 36 lo. 993 cars.
L. A. Senecal, *Gen. Supt* .... Quebec, Can.
Quebec & Lake St. John Ry. 4-8½ g. 36 m. 3 lo. 55 c.
J. G. Scott, *Manager* .... Quebec, Can.
Frank Fournier, *Supt* ... ... St. Raymond, P. Q.
John T. Eames, *M. M* ...... St. Raymond, P. Q.

R

Raleigh & Augusta Air-Line; Carolina Central Raleigh & Gaston R. Rs. 4-8½ g. 446 m. 52 lo. 1,052 c.
John C. Winder, *Gen. Man. & P. A.* Raleigh, N. C.
Raleigh Rds. 4-8½ g. 200 m. 27 lo. 638 cars.
B. R. Harding, *Supt. of Mach.* Raleigh, N. C.
Carolina Cen. R. R. 4-8½ g. 242 m. 26 lo. 431 c.
L. C. Jones, *Supt* .... Wilmington, N. C.
James Maglenn, *M. of Mach.* Laurinburg, N. C.
S. R. Ethridge, *M. C. B* ... Laurinburg, N. C.
Rhinebeck & Connecticut. (*See Hart. & Ct. Wn.*)
Richmond, Fredericksburg & Potomac R. R.
4-9 g. 81 m. 15 lo. 149 cars.
E. T. D. Myers, *Gen. Supt* .. Richmond, Va.
T. L. Courtney, *Asst. Supt* .. Richmond, Va.
H. Kuhn, *M. M* .... Richmond, Va.
W. H. Trainham, *M. C. B.* ... Richmond, Va.
Rich., York River & Ches. R. R. (*See Rich. & Dan.*)
Richmond & Alleghany R. R. 4-9 g. 261 m. 19 lo. 837c.
Decatur Axtell, *Rec. & Gen. Man.* Richmond, Va.
M. Sweeney, *Pur. Agt* .. .. Richmond, Va.
Geo. D. Harris, *M. M. & C. B.* ... Richmond, Va.
Richmond & Danville R. R. Co.'s Roads.
1,736 miles 218 loco. 3,833 cars.
A. L. Rives, *Gen. Man* .... Richmond, Va.
Peyton Randolph, *As. G. Man* .. Richmond, Va.
J. P. Minetree, *Pur. Agt* .... Richmond, Va.
R. D. Wade, *Supt. Mo. Po* .... .. Richmond, Va.
(1) Rich. & Dan. R. R. 5 g. 847 m. 131 lo. 2,687 cars.
Rich. & Dan. Div.: 5 g. 320 m. 80 lo. 1,797 c.
Wm. H. Green, *Supt* .... Richmond, Va.
M. M. ... . Richmond, Va.
J. B. Vaughan, *For. Car Sh.* .. Richmond, Va.
North Carolina Div. 5 g. 223 m. 22 lo. 268 cars.
A. B. Andrews, *Supt* .... Raleigh, N. C.
W. H. Turrentine, *M. M.* Comp'y's Shops, N. C.
J. C. Holt, *For. Car Sh.* Comp'y's Shop, N. C.
Atlanta & Char. Air Line. 5 g. 286 m. 31 lo. 415 c.
Narrow-Gauge Branches. 3 g. 80 m. 5 lo. 41 c.
Edmund Berkley, *Supt* .... Atlanta, Ga.
T. W. Gentry, *M. M.* .. .. Atlanta, Ga.
Z. T. Smith, *For. Car Sh* .... Atlanta, Ga.
(2) Charlotte, Col. & Aug. R. R. 5 g. 239 m. 22 lo. 287 c.
G. R. Talcott, *Supt* .... Columbia, S. C.
J. H. Green, *M. M.* (2 roads) .. Columbia, S. C.
(3) Columbia & Greenville R. R. 5 g. 297 m. 22 l. 224 c.
G. S. Talcott, *Supt* .... Columbia, S. C.
J. O. Meredith, *For. E. & C. Rep* .. do.
(4) Virginia Midland Ry. 4-8½ g. 353 m. 41 lo. 631 c.
Supt. Alexandria, Va.
H. M. Smith, *M. of M* .... Alexandria, Va.
J. T. Nalls, *M. C. B.* .... Alexandria, Va.
Richmond & Petersburg R. R. 4-8½ g. 25 m. 8 lo. 132 c.
J. R. Kenly, *Supt* .... Richmond, Va.
John O'Brien, *M. M* .... Richmond, Va.
Rio Grande R. R. 3-6 g. 22 m. 3 lo. 40 cars.
M. J. Gomila, *Rec. & Gen. Man.* Brownsville, Tex.
G. W. Rendall, *M. M* .... Brownsville, Tex.
M. Markwood, *M. C. B* ... . Brownsville, Tex.
Rio Grande & Pecos Ry. 4-8½ g. 27 m. In progress.
W. W. Hungerford, *Man* .... Laredo, Tex.
Rochester & Lake Ontario Ry. 4-8½ g. 6 m. 2 lo. 10 c.
N. B. Ellison, *Man* .... Rochester, N. Y.
Rochester & Pittsb'g. R. R. 4-8½ g. 260 m. 60 lo. 3,296 c.
Geo. E. Merchant, *Gen. Man* ... Rochester, N. Y.
J. T. Gardiner, *Gen. Supt* .... Buffalo, N. Y.
C. W. Mills, *Supt. M. P.* ...... Rochester, N. Y.
Rock Island & Mercer County R. R., and
Rock I'd & Peoria Ry. 4-8½ g. 113 m. 13 lo. 357 c.
R. R. Cable, *V.-P. & Gen. Supt* ..... Chicago, Ill.
R. I. & P. Ry.:
H. B. Sudlow, *Supt. & P. A* .... Rock Island, Ill.
Joseph Elder, *M. M* .... Peoria, Ill.
R. I. & M. C. Rd.: H. B. Sudlow, *Supt.* R'k Island, Ill.
J. H. Parks, *M. M* .... Rock Island, Ill.
Rogersville & Jefferson R. R. 5 g. 16 m. 1 lo. 6 cars.
C. M. Leuty, *Supt* .... Rogersville, Tenn.
Rome (Ga.) R. R. 5 g. 20 m. 2 lo. 17 cars
Eben Hillyer, *Pres. & Supt* .... Rome, Ga.
O. W. Harbin, *M. M.* ... . Rome, Ga.
Rome, Watertown & Ogdensburg R. R.
4-8½ g. 418 m. 61 lo. 1,831 cars.
H. M. Britton, *Gen. Man. & P. A.* Oswego, N. Y.
Geo. H. Haselton, *S. M. P. & M.* . Oswego, N. Y.
E'n Div.: J. D. Remington, *A. Supt.* Watertown, N. Y.
W'n Div.: W. H. Chauncey, *A. Supt.* Oswego, N. Y.
Roodhouse & Scottsville Ry. In progress.
Geo. P. Merrill, *Gen. Man* .... Chicago, Ill.
Rumford Falls & Buckfield R. R. 4-8½ g. 29 m. 2 l. 62 c.
L. L. Lincoln, *Supt. & Pur. Agt* ... Canton, Me.

S

Sabine & East Texas Ry. (*See Cen. Pac.*)
Sacramento & Placerville R. R. (*See Cen. Pac.*)
Saginaw Bay & Northw'n R. R. 4-8½ g. 31 m. 6 lo. 136 c.
J. Jackson, *Gen. Man* .... Pinconning, Mich.
F. T. Lillote, *Act. Pur. Agt* ... Pinconning, Mich.
Edward Keeler, *M. M* .... Pinconning, Mich.
Saginaw, Tuscola & Huron R. R.
3 g. 50 m. 5 lo. 85 cars.
M. B. Wilkinson, *Gen. Supt* .. E. Saginaw, Mich.
Saginaw Valley & St. Louis R. R. 4-8½ g. 39 m. 4 l. 64 c.
T. M. Fish, *Gen. Supt* .... Ionia, Mich.
N. W. Merrill, *Div. Supt* .... Saginaw, Mich.
Allan Bourn, *Pur. Agt* .. .. Detroit, Mich.
Geo. C. Watrous, *M. M* .... Ionia, Mich.
Salt Lake & Western R. R. (*See Un. Pac.*; (6) *Div.*)
San Francisco & No. Pac. 4-8½ g. 139 m. 11 lo. 245 c.
Arthur Hughes, *Gen. Man* .. San Francisco, Cal.
H. C. Whiting, *Supt* .... San Rafael, Cal.
Ed. Reynolds, *Gen. M. M* .... Donahue, Cal.
Ed. Reynolds, *M. C. B* .... Donahue, Cal.
Sanborn, Cooperstown & Turtle M. R. R. In progress.
C. A. Roberts, *Gen. Man* . ... Sanborn, Dak.
Sandy River R. R. 2 g. 18 m. 3 lo. 36 cars.
N. B. Beal, *Pres. & Supt* .... Phillips, Me.
M. Saunders, *M. M. & C. B* .... Phillips, Me.
Sandusky, Mansfield & Newark R. R. (*See B. & O.*)
Sanford & Indian River R. R. (*See So. Flor.*)
San Luis Obispo & Santa Maria R. R.
3 g. 20 m. 2 lo. 30 cars.
Charles Goodall, *Man* ...... San Francisco, Cal.
San Pete Valley R. R. 3 g. 33 m. 2 lo. 57 cars.
S. Bamberger, *Man* ..... Salt Lake City, U. T.
J. E. Bamberger, *Pur. Agt* .... Salt Lake, U. T.
B. Bates, *M. M* .... Morvin, U. T.
Saratoga, Mt. McGregor & Lake George R. R.
3 g. 11 m. 3 lo. 12 cars.
John McGee, *Supt.* .... Saratoga Springs, N. Y.
Savannah, Florida & W'n Ry. 5 g. 519 m. 62 lo. 1,063 c.
H. S. Haines, *Gen. Man* .... Savannah, Ga.
R. G. Fleming, *Supt* .... Savannah, Ga.
A. A. Aveilhé, *Pur. Agt* .... Savannah, Ga.
G. M. D. Riley, *M. of Mach* ...... Savannah, Ga.
E. Geffcken, *For. Car Dept* ..... Savannah, Ga.
Sav., Griffin & No. Ala. R. R. *Op. by Central* (*Ga.*).
Schuylkill & Lehigh R. R. (*See Phil & Read.*)
Scoharie Valley R. R. (*See Middleburg & Sch.*)
Scioto Valley R. R. 4-8¾ g. 132 m. 19 lo. 548 cars.
Geo. Skinner, *Supt. & P. Agt* ..... Columbus, O.
R. Bromley, *M. M.* . ... Portsmouth, O.
Seaboard & Roanoke R. R. 4-8½ g. 80 m. 21 lo. 384 c.
L. T. Myers, *Supt* .... Portsmouth, Va.
J. A. Walton, *Pur. Agt* .... Portsmouth, Va.
M. M. Pendleton, *S. M. P. & M.* Portsmouth, Va.
Sedalia, Warsaw & Southern Ry. (*See Mo. Pac.*)
Sharpsville R. R. 4-8½ g. 23 m. 3 lo. 13 cars.
Thos. M. King, *V. P. & Gen. Man.* Pittsburgh, Pa.
W. C. Agnew, *Asst. Gen. Man.* .. Youngstown, O.
Shelby Iron Co. R. R. { 5-9 g. 7 m. 2 lo. } 50 c.
{ 3-6 g. 12 m. 3 lo. }
J. A. McArthur, *G. Man* .. Shelby Ir. Wks, Ala.
R. H. Stoughton, *Supt* .. Shelby Iron Wks., Ala.
J. H. Burghardt, *M. M* .. Shelby Iron Wks, Ala.
Shell Beach R. R. 5 g. 22 m.
M. R. Spelman, *Supt* .... New Orleans, La.
Shenandoah Valley R. R. 4-9 g. 249 m. 32 lo. 849 c.
D. W. Flickwir, *Gen. Supt* .... Roanoke, Va.
W. C. De Armond, *Pur. Agt.* .. Philadelphia, Pa.
Supt. of M. P. .. Roanoke, Va.
W. A. Morgan, *M. C. B* .... Lynchburg, Va.
J. T. Robinett, *M. M* .... Petersburg, Va.
Shenango & Allegheny R. R. 4-8½ g. 74 m. 8 lo. 248 c.
J. T. Blair, *G. Man. & Pur. Agt.* Greenville, Pa.
Edw. Richardson, *M. M. & C. B.* Greenville, Pa.
Shepaug R. R. 4-8½ g. 38 m. 3 lo. 28 cars.
Edwin McNeill, *Supt* .... Litchfield, Ct.
A. J. Broughet, *M. M* .... Litchfield, Ct.
Ship Is., Ripley & Ky. R. R. 3 g. 25 m. 2 lo. 23 cars.
C. L. Harris, *Supt. & Pur. Agt* .... Ripley, Miss.
W. H. Phelps, *M. M* .... Ripley, Miss.
Silver City, Deming & Pacific R. R. 3 g. 47 m. 3 l. 141 c.
John W. Smith, *Gen. Supt* .... Silver City, N. M.
Silver Lake Ry 4-8½ g. 6 m. 1 lo. 4 cars
C. W. S. Nobles, *Supt* .... Perry, N. Y.
Sinaloa & Durango R. R. 4-8½ g. 39 m. 2 lo. 40 cars.
Geo. S. Skilton, *Gen. S.* Culiacan, Sinaloa, Mex.
John E. Bell, *M. M* .... Culiacan, Mex.
Skaneateles R. R. 4-8½ g. 5 m. 2 lo. 5 cars.
J. McNamara, *Supt* .... Skaneateles, N. Y.
Sioux City & Pacific R. R. 4-8½ g. 427 m. 31 lo. 893 c.
W. P. Linsley, *Gen. Man* .... Missouri Valley, Ia.
C. M. Lawler, *Gen. Supt* .... Missouri Valley, Ia.
R. W. Hamer, *Pur. Agt* .. .. Chicago, Ill.
W. G. Brownson, *Asst. Supt* .... . Norfolk, Neb.
S. A. Teal, *M. M* .... Missouri Valley, Ia.
W. H. Ramseyer, *M. C. B.* .. Missouri Valley, Ia.
Smyrna & Delaware Bay R. R. (*See Kent County.*
Sodus Bay Ry. (*See Northern Central.*
Somerset R. R. 4-8½ g. 25 m. 3 lo. 24 cars.
W. M. Ayer, *Supt & Pur. Agt* ...... Oakland, Me.
S. P. Mosher, *For. Car Rep* .... . Oakland, Me.
C. Crowell, *For. Lo. Rep's.* ... No. Anson, Me.
Sonora Ry. (*See A., T. & S. Fe.*)
Sonoma Valley:
Arthur Hughes, *Gen. Man.* San Francisco, Cal.
H. C. Whiting, *Supt* .... San Rafael, Cal.
J. T. Peters, *Asst. Supt* .... Glen Ellen, Cal.
Ed. Reynolds, *M. M* ... . Donahue, Cal.
South & North Alabama R. R. (*See Louis. & Nash.*)
South Carolina Ry. 5 g. 246 m. 46 lo. 834 cars.
John B. Peck, *Gen. Man.* ...... Charleston, S. C.
S. B. Pickens, *Pur. Agt* .... Charleston, S. C.
P. J. Cochrane, *Mast. of Mach.* Charleston, S. C.
Geo. H. Gramling, *M. C. B* .... Charleston, S. C.
South-Eastern Ry. 4-8½ g. 280 m. 30 lo. 1,000 cars.
T. A. McKinnon, *Gen. Man* ..... Montreal, Can.
Robt. McLoud, *M. M* .... Farnham, P. Q.
South Florida R. R. 3 gauge 115 m. 13 lo. 250 cars.
B. R. Swoope, *Supt. & P. A* .... Sanford, Fla.
R. Derby, *M. M* .... Sanford, Fla.
A. D. Stentiford, *M. C. B* .... Sanford, Fla.
South Mountain R. R. 4-8½ g. 18 m. 4 lo. 22 c.
W. H. Woodward, *Supt.* Pine G've Furnace, Pa.
South Pacific Coast R. R. 3 g. 81 m. 16 lo. 500 cars.
L. Fillmore, *Gen Supt* ...... San Francisco, Cal.
W. H. Masterman, *M. M. & C. B.* Newark, Cal.

South-Western R. R. (Ga.) (*See Central of Ga.*)
South-Western Ry. (Ky.) 4-8½ g. 5 m. 1 lo. 28 cars.
M. Tabler, *Supt. & Man*......Harrodsburg, Ky.
J. C. Hool, *Pur. Agt*..........Harrodsburg, Ky.
Southern Central R. R. 4-8½ g. 156 m. 21 lo. 467 c.
H. D. Titus, *Gen. Supt. & P.A.*....Auburn, N.Y.
John White, *M. M*............Auburn, N. Y.
H. Mooney, *M. C. B*.............Auburn, N. Y.
Southern Kansas Ry. (*See At., Top. & Santa Fe.*)
Southern Maryland R. R. 4-8½ g. 20 m. 1 lo. 20 c.
J. B. Ridgway, *Supt*.........Brandywine, Md.
C. R. Joyce, *M. M*...........Brandywine, Md
Southern Pacific R. R. 4-8½ g. 203 m. 335 lo. 780 c
Northern Div. (*For other Divs. see Cen. Pac.*)
A. C. Bassett, *Supt*.......San Francisco, Cal.
J. R. Watson, *Pur. Agt*.....Sacramento, Cal.
J. T. Wilson, *M. M*.......San Francisco, Cal.
F. N. Bellisle, *M. C. B*....San Francisco, Cal.
Southern Pacific R. R. of Arizona. (*See Cen. Pac.*)
Southern Pacific R. R. of New Mexico. (*See Cen. Pac.*)
Spartanburg, Union & Columbia R. R.
(*See Rich. & Dan.*; (3) *Div.*)
Spring Brook R. R. 4-3 g. 8 m. 1 lo. 18 cars.
Charles Pugh, *Pres*..........Pittston, Pa.
Spring Hill & Parrsboro Ry. (*See Cumberland.*)
Springfield, Effingham & So.-E'n Ry. (*See Ind. & Ill.*)
Springville & Sardinia Ry. 4-8½ g. 12 m. 1 lo. 8 c.
Bertrand Chaffee, *Pres*.......Springville, N. Y.
St. Croix & Penobscot R. R. 4-8½ g. 22 m. 4 lo. 195 c.
S. W. Haycock, *Supt. & Pur. Agt.* .Calais, Me.
G. H. Corsen, *M. M*............Milltown, Me
H. C. Tincker, *M. C. B*...........Milltown, Me
St. Helen, Houghton Lake & West. R.R. 4-8½ g. 13 m.
Z. C. Jessop, *Gen. Man*..........Detroit, Mich
St. John & Maine Ry. (*See New Brunswick.*)
St. John's Ry. 4-8½ g. 14½ m. 2 lo. 24 cars.
R. McLaughlin, *Pr. & Supt.* .Jacksonville, Fla.
J. M. Owens, *M. of Mach*....St. Augustine, Fla.
St. John's & Lake Eustis Ry. (*See Florida Southern.*)
St. Johnsb'ry & Lake Champ 4-8½ g. 120 m 15 lo. 372 c
A. B. Jewett, *Supt. & P. A.*..St. Johnsbury, Vt
Geo. E. Howe, *M. M. & C. B.* St. Johnsbury, Vt
St. Joseph Valley R. R. 3 g. 15 m. 1 lo. 11 cars
B. Helmick, *Gen. Man*.......Buchanan, Mich
St. Joseph & Des Loge Ry. 3 g. 13 m. 4 lo. 70 cars.
T. T. Onderdonk, *Supt*......Bonne Terre, Mo
E. B. Keyes, *M. C. B*.........Bonne Terre, Mo
St. Joseph & Western R. R.
4-8½ g. 252m. 21 lo. 175 cars.
L. D. Tuthill, *Gen. Supt. & P. A.* St. Joseph, Mo.
E. Sleepy, *M. M. & C. B*....St. Joseph, Mo.
St. Joseph & Des Moines R. R. (*See K. C., St. J. & C. B.*)
St. Lawrence & Ottawa Ry. (*See Can. Pac.*)
St. Louis, Alton & Terre Haute R. R.
Main Line. (*See C., C., C. & I.; Ind. & St. L. Div.*
St. Louis & Cairo Div.: 4-8½ g 137 m. 19 lo. 800 c
G. W. Parker, *Gen. Man*.....E. St. Louis, Ill.
J. L. Hinckley, *Supt*...........Belleville, Ill
R. M. Pringle, *M. M*..........E. St. Louis, Ill.
St. Louis Bridge Co. and Tunnel R. R.
4-8½ g. 31 m. 22 lo. 11 cars.
Wm. Taussig, *Gen. Man*..........St. Louis, Mo
A. W. Dickinson, *Supt*...........St. Louis, Mo.
J. E. Williams, Jr., *Pur. Agt*....St. Louis, Mo
Geo. W. Walshe, *M. M*............St. Louis, Mo
St. Louis, C. Cœur & St. Ch. Ry. 3 g. 16 m.
F. M. Colburn, *Gen. Man*.......St. Louis, Mo.
St. Louis Coal R. R. 4-8½ g. 93 m. 10 lo. 217 cars.
Robt. Meek, *Supt*..............Carbondale, Ill.
Jas. C. Bryden, *Pur. Agt*........St. Louis, Mo.
St. Louis, Des Moines & Northern Ry. 4-8½ g. 43 m.
C. F. Merk, *Supt*...............Des Moines, Ia.
St. L., Ft. Scott & Wichita R.R. 4-8½ g. 214 m. 6 l. 337 c.
J. W. Miller, *V.P. & Gen. Man*..Fort Scott, Kan.
Tho. N. Lewis, *Asst. Supt*......Fort Scott, Kan.
Henry Berger, *M. M*.............Ft. Scott, Kan.
St. L., Hannibal & Keokuk. 4-8½ g. 85 m. 5 lo. 70 c.
E. C. Case, *Rec. & Man*........Hannibal, Mo.
E. W. Hoisington, *M. M*.........Hannibal, Mo.
St. Louis, Iron Mt. & So'n Ry. (*See Mo. Pac.*; (4) *Div.*)
St. L., Keokuk & No.-W'n. Ry. (*See C., B. & Q.*)
St. L., Salem & Little Rock. 4-9 g. 72 m. 5 lo. 111 c.
H. A. Crawford, *V. Pr. & P. A*...St. Louis, Mo.
E. B. Sankey, *Supt*.................Salem, Mo.
Thomas Everson, *M. M*..........Steelville, Mo
J. W. Houston, *M. C. B*...........Steelville, Mo.
St. Louis & Cairo R. R. 3 g. 152 m. 22 lo. 896 cars.
Chas. Hamilton, *Gen. Supt*......St. Louis, Mo.
E. J. Newell, *M. M*..............E. St. Louis, Mo.
St. L. & San Fran. Ry. 4-8½ g. 943 m. 103 lo. 3,737 c.
C. W. Rogers, *V. P. & Gen. Man*..St. Louis, Mo.
D. H. Nichols, *Supt. Tran*..No. Springfield, Mo.
A. P. Mann, Jr., *Pur. Agt*........St. Louis, Mo.
M. Kearney, *M. M. & C. B.*..No. Springfield, Mo.
East Div.: A. Veech, *Supt*.........St. Louis, Mo
Central Div.: W. A. Thoms, *Supt*..Springfield, Mo.
Kan. Div.: J. R. Wentworth, *Supt.* Neodesha, Kan.
St. Martin's & Upham Ry. 4-8½ g. 30 m. 2 lo. 8 cars.
A. E. Killam, *Manager*........St. Martin's, N. B.
St. Paul Eastern Grand Trunk Ry. 4-8½ g. 15 m.
D. C. Lamb, *Gen. Supt*..........Oconto, Wis.
St. Paul, Minneapolis & Manitoba Ry.
4-8½ g. 1,402 m. 201 lo. 5,068 cars.
A. Manvel, *Gen. Man*............St. Paul, Minn.
H. C. Ives, *Asst. Gen. Man*......St. Paul, Minn.
E. B. Wakeman, *Asst. Gen. Supt.* St. Paul, Minn.
J. C. Morrison, *Pur. Agt*........St. Paul, Minn.
Thos. Downing, *M. M. & C. B*..St. Paul, Minn.
Breck. Div.: W. S. Kemp, *Supt*...St. Paul, Minn.
F. F. Div.: J. B. Rice, *Supt*........St. Paul, Minn.
No'n Div.: A. Guthrie, *Supt*.....Crookston, Minn.
St. Paul & Duluth R. R. 4-8½ g. 225 m. 37 lo. 1,080 c.
W. H. Fisher, *Gen. Supt*.........St. Paul, Minn.
J. G. Callahan, *Pur. Agt*.........St. Paul, Minn.
Chas. F. Ward, *M. M. & M. C. B*..St. Paul, Minn.
State Line & Sullivan R. R. 8½ g. 25 m. 3 lo. 263 c.
I. O. Blight, *Supt*...............Towanda, Pa.
Staten Island R. R. ¼ g. 13 m. 4 lo. 18 c
J. W. Wilbur, *Supt*...........New York, N. Y.
Stony Clove & Catskill Mountain R. R.
3 g. 14 m. 2 lo. 22 cars.
Geo. Coykendall, *Gen. Supt*....Rondout, N. Y.
Stony Creek R. R. 4-8½ g. 103 m.
Geo. B. Boggs, *Supt*..........Norristown, Pa.
Sterling Mountain Ry. 6 g. 8 m. 2 lo. 145 cars.
J. C. Missimer, *Supt*..........Sloatsburg, N. Y.
Suffolk Lumber R. R. 3 g. 15 m. 3 lo. 41 cars.
W. M. Whaley, *Supt.*..............Suffolk, Va.
Summit Branch R. R. 4-9 g. 20 m. 7 lo. 10 cars.
Thomas Gucker, *Supt*........Williamsport, Pa.
Susquehanna & Delaware River R. R. In progress.
D. Y. Kilgore, *Pres*...........Philadelphia, Pa.
Sussex R. R. (*See Del., Lack. & West.*)
Syracuse, Binghamton & N. Y. R. R. (*See D. L. & W.*)
Syr., Ontario & N. Y. R. R.
Albert Allen, *Supt*............New York, N. Y.
Syracuse, Geneva & Corning; Corning, Cowanesque & Antrim R. Rs. 4-8½ g. 142 m. 28 lo. 1,044 c.
A. H. Gorton, *Supt*...........Corning, N. Y.
W. E. Gorton, *Asst. Supt*.........Corning, N. Y.
W. H. Chaphe, *Pur. Agt*.........Corning, N. Y.
O. C. Patchell, *M. M*.............Corning, N. Y.
C. J. Butler, *M. C. B*............Corning, N. Y.

T

Tennessee Coal R. R. 5 g. 28 m. 8 lo. 204 cars.
A. M. Shook, *Gen. Man*.......Tracy City, Tenn.
W. A. Knight, *M. M*.........Tracy City, Tenn.
Tennessee & Sequatchee Valley R. R.
3 g. 42 m. 1 lo. 24 cars.
Chas. Clinton, *Gen. Supt*....Spring City, Tenn.
P. V. Mooney, *Pur. Agt*.....Spring City, Tenn.
Terre Haute & Indianapolis R. R.
4-9 g. 421 m. 105 lo. 4,318 cars.
Joseph Hill, *Gen. Supt*........St. Louis, Mo.
C. R. Peddle, *P. Agt*........Terre Haute, Ind.
Geo. H. Prescott, *S. M. P. & M.* Terre Haute, Ind.
F. C. Cleaver, *M. M*.........Terre Haute, Ind
E. D. Carter, *M. C. B*.......Terre Haute, Ind.
Chas. Butler, *M. M*............Effingham, Ill.
Clinton Idler, *Foreman*......Indianapolis, Ind.
Terre Haute & So.-Eastern Ry. 4-9 g. 44 m. 2 lo. 145 c.
Geo. Atherton, *Supt*.........Terre Haute, Ind.
Texas-Mexican Ry. (*See Mex. Nat.*)
Texas Trunk R. R. 4-8½ g. 36 m. 2 lo. 8 cars)
Hugh Irwin, *Gen. Supt*............Dallas, Tex.
Texas Western Ry. 3 g. 52 m. 2 lo. 44 cars.
Henry Hatch, *Gen. Man*..........Houston, Tex.
T. F. Glispin, *M. M*..............Houston, Tex.
Texas & N.O.R. R. (*See Cen. Pac.; G. H. & S. A. Div.*,
Texas & Pacific. (*See Mo. Pac. Ry.*; (6) *Div.*,
Texas & St. Louis Ry. 3 g. 769 m. 84 lo. 2,000 cars.
S. W. Fordyce, *Rec. and Gen. Man.* St. Louis, Mo.
J. J. Frey, *Gen. Supt*..........Pine Bluff, Ark.
C. S. Brooke, *Pur. Agt*..........St. Louis, Mo.
M. C. B..........Pine Bluff, Ark.
Mo. & Ark. Div.:
W. H. Adams, *Supt*..........Pine Bluff, Ark.
Rich. Williams, *M. M*.......Pine Bluff, Ark.
Tex. Div.: H. Flanders, *Supt*..........Tyler, Tex.
J. A. Hanglin, *Gen. M. M*...........Tyler, Ark.
Tionesta Valley R. R. 3 g. 15 m.
George Dickinson, *Gen. Supt*....Sheffield, Pa.
Tioga R. R. 4-8½ and 6 g. 67 m. 18 lo. 960 cars
L. H. Shattuck, *Supt*............Blossburg, Pa.
J. C. Guthrie, *Pur. Agt*......New York, N. Y.
Pere Bonny, *M. M*................Blossburg, Pa.
D. H. Stratton, *M. C. B*.........Blossburg, Pa.
Toledo, Ann Ar. & No. Mich. Ry.
4-8½ g. 63 m. 9 lo. 186 c.
J. M. Ashley, *Gen. Man*......Ann Arbor, Mich.
H. W. Ashley, *Supt. & Pur. Agt.* do
C. C. Dodge, *M. M*............Ann Arbor, Mich.
Toledo, Cin. & St. Louis R.R. 3 g. 798 m. 101 lo. 3,500 c.
E. P. Murray, *Gen. Supt*..........Toledo, O.
F. W. Stewart, *P. Agt*..............Toledo, O.
Thos. Robertson, *M. M*.............Delphos, O.
Toledo Div.: W. H. Vandergrift, *Supt.*; do
J. S. Wiers, *For. Car Rep*........Delphos, O.
St. Louis Div.: Frank F. Allen....Charleston, Ill.
P. H. Murphy, *M. M*...........Charleston, Ill.
Toledo, Peoria & Western R. R. 4-8½ g. 223 m.
E. N. Armstrong, *Supt*..............Peoria, Ill.
Toledo & Indianapolis R. R. 4-8½ g. 43 m. 4 lo. 118 c.
David Robison, Jr., *Rec*..............Toledo, O.
Toledo & Ohio Central R. R.
4-8½ g. 325 m. 46 lo. 4,760 cars.
T. M. Peelar, *Supt*.................Bucyrus, O.
F. W. Stewart, *Pur. Agt*...........Toledo, O.
J. B. Morgan, *M. M*...............Bucyrus, O.
Tonawanda Val. & Cuba R. R. (*See Brad., B. & K.*)
Toronto, Grey & Bruce Ry. (*See Canadian Pacific.*)
Toronto & Nipissing Ry. (*See Mid. Ry. of Can.*)
Troy & Boston R. R. 4-8½ g. 48 m. 20 lo. 484 cars.
D. Robinson, *Pres*.................Troy, N. Y.
Joseph Crandell, *Supt*.............Troy, N. Y.
C. H. Hubbell, *Pur. Agt*...........Troy, N. Y.
Z. B. Davis, *M. M*..................Troy, N. Y.
A. Brewer, *M. C. B*.................Troy, N. Y.
Troy & Greenfield R. R. & H. Tunnel. 4-8½ g. 44 m.
A. W. Locke, *Man*.........North Adams, Mass.
Tuckerton R. R. 4-9 g. 31 m. 2 lo. 29 cars
J. J. Pharo, *Supt. & Pur. Agt.* Tuckerton, N. J.

U

Ulster & Delaware R. R. 4-8½ g. 74 m. 10 lo. 218 cars.
Jas. H. Jones, *Supt*...........Rondout, N. Y.
John H. Decker, *M. C. B*........Rondout, N. Y.
Union Ry. 5 g. 9 m. 3 lo.
C. E. James, *Pres*.........Chattanooga, Tenn.
D. J. O'Connell, *Gen. Man.* Chattanooga, Tenn.
Union Pacific Ry. (7 Gen. Divs.)
3 & 4-8½ g. 4,633 m. 510 lo. 10,550 cars.
S. R. Callaway, *Gen. Man*.........Omaha, Neb.
S. T. Smith, *Gen. Supt*............Omaha, Neb.
Thos. L. Kimball, *Asst. Gen Man.* Omaha, Neb.
Pur. Agt.............Omaha, Neb.
I. H. Congdon, *S. M. P. & C. D*...Omaha, Neb.
John Wilson, *Asst. do*..............Omaha, Neb.
(1) Neb. Div.: O. H. Dorrance, *Gen. Supt.* Omaha, Neb.
E. Div.: C. B. Havens, *Supt*..........Omaha, Neb.
J. H. McConnell, *M. M*......North Platte, Neb.
A. M. Collett, *M. C. B*...........Omaha, Neb.
L. Pole Div.: W. A. Deuel, *Supt*..Cheyenne, W. T.
J. H. McConnell, *M. M*.........N. Platte, Neb.
(2) Wy. Div.: E. Dickenson, *Gen. Supt*..Laramie, W. T.
T. A. Davis, *M. M*...........Laramie, W. T.
Wes. Div.: C. E. Wurtelle, *Supt.* Evanston, W. T.
Geo. F. Chapman, *M. M*......Evanston, W. T.
(3) Idaho Div.: R. Blickenderfer, *Gen. Supt.* Ogden, U.
John S. Hickey, *M. M*..........Shoshone, Id.
Ogden Short Line Div.:
R. Blickensderfer, *Supt*.........Pocatello, Id.
Utah & Northern Div.:
J. S. Hickey, *M. M*..........Eagle Rock, Id.
J. W. Paul, *Gen. For. C. D*...Eagle Rock, Id.
(4) Col. Cent. Div.: A. A. Egbert, *Gen. Supt.* Denver, Col.
F. Meirtsheimer, *M. M*...........Denver, Col.
C. C. Div.: P. Touhy, *Supt*..........Denver, Col.
So. Park Div.: J. T. Choate, *A. Supt*..Como, Col.
(5) Kan. Div.: H. O. Brinkerhoff, *G. Supt.* Kan. City, Mo.
K. Pac. Div.: J. O. Brinkerhoff, *Supt.* Kan. C'y, Mo.
J. O. Chapman, *M. M*.......Armstrong, Kan.
T. B. Roberts, *M. C. B*......Armstrong, Kan.
Kansas Central Div.:
J. O. Brinkerhoff, *Supt*..Leavenworth, Kan.
Smoky Hill Div.:
O. H. Dorance, *Supt*...........Wallace, Kan.
J. B. Dailey, *M. M*...............Ellis, Kan.
6 Salt Lake & Western Div.:
W. W. Ritter, *Supt*.....Salt Lake City, Utah.
United States Rolling Stock Co. 19 lo. 4,692 cars.
A. Hegewisch, *Pres*............New York, N. Y.
W. H. Chaddock, *Gen. Agt*........Chicago, Ill.
Utah Central Ry. 4-8½ g. 280 m. 21 lo. 358 cars.
John Sharp, *Gen. Supt*..Salt Lake City, Utah.
S. H. Hill, *Pur. Agt*.....Salt Lake City, Utah.
Geo. G. Bywater, *M. M*..Salt Lake City, Utah
Peter Reid, *M. C. B*.......Salt Lake City, Utah.
Utah & Nevada Ry. 3 g. 37 m. 3 lo. 33 cars
W. W. Ritter, *Gen. Man*...Salt Lake City, Utah.
Robert Anderson, *M. M*...Salt Lake City, Utah.
Utah & Northern Ry. (*See Union Pac.*; (3) *Div.*)
Utah & Pleasant Valley Ry. (*See Den. & Rio. Gr.*)
Utica, & Black Riv. R. R. 4-8½ g. 180 m. 25 lo. 412 c.
E. A. Van Horne, *Gen. Supt. & P. A.*..Utica, N. Y.
H. W. Hammond, *Asst. Supt*.......Utica, N. Y.
John Bailey, *M. M*.................Utica, N. Y.
David James, *M. C. B*.............Utica, N. Y.

V

Vaca Vall. & Clear Lake R. R. 4-8½ g. 30 m. 2 lo. 19 c.
G. B. Stevenson, *Gen. Supt*.......Vacaville, Cal
Valley Ry. (Ohio) 4-8¾ g. 75 m. 20 lo. 889 cars.
Isaac Reynolds, *Gen. Man*.......Cleveland, O.
H. Melcher, *Pur. Agt*..............Cleveland, O.
C. T. Johns, *M. M*................Cleveland, O.
Valley R. R. Va. 4-8½ g. 62 m
S. Spencer, *Pres*...............Baltimore, Md.
Vicksburg & Brunswick R. R. (*See Cen. of Ga.*)
Vicksburg & Meridian R.R. (*See Cin., N.O. & Tex. Pac.*)
Vicks. Shreveport & Pac. R. R. (*See C., N. O. & T. P.*)
Victoria Ry. (*See Midland Ry. of Can.*)
Virginia Midland Ry. (*See Rich. & Dan.*; (4) *Div.*)
Virginia & Truckee R. R. 4-8½ g. 52 m. 14 lo. 322 c.
Carson & Colorado R. R. 3 g. 294 m. 8 lo. 228 c
H. M. Yerington, *Gen. Supt*.......Carson, Nev.
R. J. Laws, *A. Supt.* (C. & Col.) Hawthorne, Nev.
Hume Yerington, *Pur. Agt*.........Carson, Nev.
I. N. Fording, *M. M*...............Carson, Nev.
M. M. Hyde, *M. C. B*..............Carson, Nev.

W

Wabash, Chester & W'n R. R. (*See St. Louis Coal.*)
Wabash, St. Louis & Pacific Ry. (4 Gen. Divs.)
4-8½ g. 3,241 m. 598 lo. 17,230 cars.
Jas. F. Joy, *Pres*..............St. Louis, Mo.
A. L. Hopkins, *V. P*.............St. Louis, Mo.
A. A. Talmage, *Gen. Man*.......St. Louis, Mo.
H. H. Wellman, *Pur. Agt*........St. Louis, Mo.
J. B. Barnes, *Supt. M. P. & M.* Springfield, Ill.
M. M. Martin, *Supt. Car Dept*.....Decatur, Ill.
(1) Eas'n Div.: G. W. Stevens, *Supt*........Peru, Ind.
O. J. Wilson, *M. M*........Fort Wayne, Ind.
A. W. Quackenbush, *Asst. M. M*.. Peru, Ind.
Thos. Anderson, *M. C. B*.........Peru, Ind.
Cairo Div.: C. F. Lape, *M. M*....Mt. Carmel, Ill.
(2) Middle Div.: *Supt.* Decatur, Ill.
Henry Seips, *M. M*............Springfield, Ill.
B. B. Rose, *M. C. B*...............Decatur, Ill.
G. A. Hurd, *Asst. Supt*.............Decatur, Ill.
E. B. Hyde, *Asst. Supt*.............Havana, Ill.
(3) Western Div.: R. G. Butler, *Supt*....Moberly, Mo
W. J. Brokaw, *M. M*..............Moberly, Mo.
John Lang, *M. C. B*...............Moberly, Mo.
D. Moin. Div.: C. F. Meek, *A. Supt.* Des Moines, Ia
Walden's Bridge R. R. 3 g. 23 m. 3 lo. 37 cars.
John G. Scott, *Gen Man*....Jenks P. O., Tenn.
Wallkill Valley.
J. E. Childs, *Gen. Supt*........New York, N. Y.
Geo. H. Graves, *Supt*...........Kingston, N. Y.
E. Minshull, *M. M*............Middletown, N. Y.
I. W. Fowler, *Pur. Agt*.......Middletown, N. Y.
Walla Walla & Columbia Riv. R. R. (*See Ore. Ry.*)
Walton R. R. 5 g. 10 m. 1 lo. 7 cars.
D. H. Walker, *Pres*...............Monroe, Ga.
Warren & Farnsworth Valley R. R.
3 g. 16 m. 3 lo. 39 cars.
A. D. Wood, *Gen. Man*...........Warren, Pa.
Warwick Valley R. R. (*See Leh. & Hud. River.*)
Washington, Ohio & West. R. R. 4-8½ g. 52 m. 5 lo. 87 c.
S. M. Brophy, *Supt*.............Alexandria, Va.
W. Mountjoy, *Act. For*..........Alexandria, Va.
John Harrison, *M. C. B*.........Alexandria, Va.
Waynesburg & Washington Rd. 3 g. 29 m. 3 lo. 26 c.
C. E. Bower, *Supt*.............Waynesburg, Pa.
A. M. Kline, *M. C. B*..........Waynesburg, Pa.
Welland Ry. 4-8½ g. 25 m. 4 lo. 147 cars.
William Pay, *Supt*..........St. Catharines, Ont.
Jas. Taylor, *M. M*...........St. Catharines, Ont.
Wm. H. Pay, *M. C. B*......St. Catharines, Ont.
West Feliciana R. R. 4-8½ g. 27 m. 2 lo. 22 cars.
J. B. McGehee, *Pr. & Gen. Supt.* Bayou Sara, La.
J. A. Tilton, *M. M. & C. B*.....Bayou Sara, La.
W. Va., Central & Pittsb'g Ry. 4-8½ g. 50 m. 4 lo. 119 c
T. B. Davis, *Gen. Man*.......Piedmont, W. Va.
W. E. Porter, *Gen. Supt*......Piedmont, W. Va.
Geo. W. Harrison, *Pur. Agt*...Piedmont, W. Va.
E. W. Lippencott, *M. M*.....Piedmont, W. Va.
West & East R. R. (*See Ill. Cen.; N. O. Div.*)
West Jersey R. R. (*See Penn. R. R.*; (3) *Div.*)
Western R. R. (of Ala.) 5 g. 85 m. 15 lo. 270 cars.
Atlanta & W. Point Rd. 5 g. 87 m. 14 lo. 240 c.
Cecil Gabbett, *Gen. Man. & Supt*...Mont., Ala.
C. D. Wall, *M. M. & C. B*......Montgomery, Ala.
Western Counties' Ry. 4-8½ g. 67 m. 8 lo. 137 cars.
J. Brignell, *Supt*.............Yarmouth, N. S.
Western Maryland R. R. 4-8½ g. 127 m. 28 lo. 610 c.
J. M. Hood, *Pr. & Gen. Man*....Baltimore, Md.
R. J. Adair, *Pur. Agt*............Baltimore, Md.
David Holtz, *Mast. of Mach.*..Union Bridge, Md.
J. H. Nussear, *M. C. B*.......Union Bridge, Md.
Western No. Carolina R. R. 5 g. 210 m. 17 lo. 160 c.
V. E. McBee, *Supt*..............Salisbury, N. C.
Jos. P. Minetree, *Pur. Agt*.......Richmond, Va.
G. W. Gates, *M. M*..............Salisbury, N. C.
Western & Atlantic R. R. 5 g. 138 m. 58 lo. 952 c.
R. A. Anderson, *Gen. Supt*.........Atlanta, Ga.
A. B. Bostwick, *Asst. Supt*.........Atlanta, Ga.
Lamar Collier, *M. M*...............Atlanta, Ga
Wm. Kinyon, *M. C. B*..............Atlanta, Ga.
Wheeling, Pittsburg & Baltimore R. R. (*See B. & O.*)
Wheeling & Lake Erie R. R. 267 m. 37 lo. 1,922 c.
M. D. Woodford, *Rec. & Gen. Man*..Toledo, O.
O. P. Dunbar, *Gen. M. M*..........Norwalk, O.
John Hillhouse, *Div. M. M*........Norwalk, O.
Cleve. & Mar. Div.: P. Pease, *Rec. & Gen. Man.*
A. Galloway, *M. M*...........Cambridge, O.
Whitby, Port Perry & Lindsay Ry. (*See Mid. of Can.*)
White Water R. R. (*See Ft. W., Cin. & Lou.*)
Whitefield & Jefferson R. R. (*See Bos., Con. & Mon.*)
Whitneyville & Machiasport R. R. 8 m. 2 lo. 48 c.
C. Sullivan, *G. M. & Pur. Agt.* Whitneyville, Me.
Wicomico & Pocomoke R. R. 4-8½ g. 30 m. 2 lo. 38 c.
L. Showell, *Pres*...................Berlin, Md.
Williamsport & North Branch R. R.
4-8½ g. 14 m. 2 lo. 4 cars.
B. G. Welch, *Man. & P. Agt*...Hughesville, Pa.
Williamstown & Del. River R. R.
4-8½ g. 27 m. 1 lo. 12 cars.
Samuel Garwood, *Supt*.....Williamstown, N. J.
Wilmington, Columbia & Augusta R. R. (*See W. & W.*)
Wilmington & No'n R. R. 4-8¾ g. 85 m. 17 lo. 155 c.
A. G. McCausland, *Supt. & P. A.* Wilmington, Del.
George Rommel, *M. M*........Wilmington, Del.
Alex. Maitland, *M. C. B*......Wilmington, Del.
Wilmington & Weldon; Northeastern; S. C. Central; Cheraw & Darlington; Cheraw & Salisbury; and Wilmington, Columbia & Augusta R. Rs.
4-8½ g. 682 miles 104 locomotives 1,725 cars.
H. Walters, *Gen. Man*...........Baltimore, Md.
J. F. Divine, *Gen. Supt*.......Wilmington, N. C.
John Bisset, *M. M*............Wilmington, N. C.
W. H. Day, *M. C. B*..............Florence, S. C.
J. H. Davis, *M. C. B.* (W. & W.). Wilmington, N. C.
Winifrede R. R. 4-9 g. 5 m. 1 lo. 65 cars.
Theodore Wright, *Pres*.........Philadelphia, Pa.
Windsor & Annapolis Ry. 4-8½ g. 130 m. 10 lo. 160 c.
P. Innes, *Gen. Man*...............Kentville, N. S.
Wm. Yould, *M. M*................Kentville, N. S.
Wm. Grierson, *M. C. B*.........Kentville, N. S.
Wisconsin Central R. R. 4-8½ g. 480 m. 59 lo. 1,800 c
F. N. Finney, *Gen. Man*.........Milwaukee, Wis.
E. K. Howes, *Pur. Agt*.........Milwaukee, Wis.
H. A. Barnes, *M. M*.............Stevens Pt., Wis.
Mil. East. Mid. So. & No. Divs.:
A. A. Allen, *Supt*...............Milwaukee, Wis.
Wis. & Minn. and Minn. St. C. & Wis. R.R.'s.:
G. T. Wiswell, *Supt*......Chippewa Falls, Wis.
Wisconsin, Iowa & Nebraska.
G. C. McMichael, *Supt*.......Marshalltown, Ia.
J. V. Johnston, *Pur. Agt*.....Marshalltown, Ia.
M. C. Wheeler, *M. M*.........Marshalltown, Ia.
Wisconsin & Michigan R. R. (*See Mil. & North'n.*)
Wisconsin & Minnesota R. R. (*See Wis. Cen.*)
Woodruff Sleeping & Parlor Coach Co.
Job H. Jackson, *Pres*..........Philadelphia, Pa.
Wm. G. Johnston, *V-Pres*....Philadelphia, Pa.
J. C. Paul, *Gen. Man*..........Philadelphia, Pa.
R. A. Rutherford, *Supt*.......Philadelphia, Pa.
Wood River Branch R. R. 4-8½ g. 6 m. 2 lo. 3 cars.
L. M. Barber, *Supt*...........Hope Valley, R. I.
Woodstock R. R. 4-8½ g. 14 m. 1 lo. 3 cars.
J. G. Porter, *Supt*...............Woodstock, Vt.
Worcester, Nashua & Rochester R.R.
4-8½ g. 95 m. 20 lo. 523 cars.
Chas. Howard, *Gen. Man*....Worcester, Mass.
G. W. Hurlburt, *Supt*..........Worcester, Mass.
A. R. Barrett, *M. M. & C. B*..Worcester, Mass.
Worcester & Shrewsbury R. R. 3 g. 3 m. 3 lo. 9 c.
J. F. Bigelow, *Supt*...........Worcester, Mass.
G. E. Hapgood, *Pur. Agt*......Worcester, Mass.
Chas. Cleveland, *M. M*.......Worcester, Mass.
Worcester & Somerset R. R. (*See N.Y., Phil. & Nor.*)

Y

York & Peach Bottom Ry. 3 g. 40 m. 5 lo. 100 c.
S. M. Manifold, *Supt. & Pur. Agt*.....York, Pa.
G. W. Hoover, *M. M*...................York, Pa.

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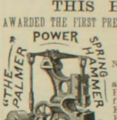

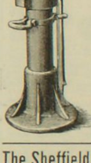

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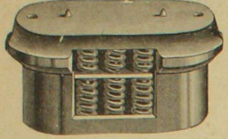

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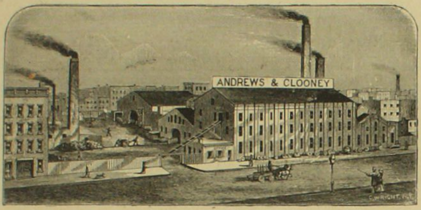

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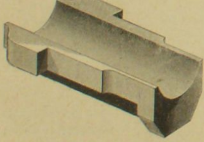

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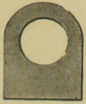

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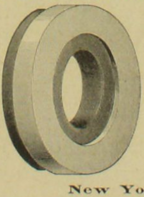

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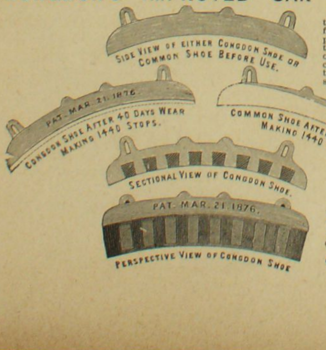
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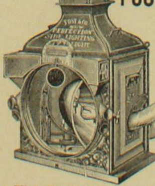

(View showing Side Signals, Numbers and Nicholson's Pat. Colored Signals, with Reflector turned in position for lighting. No more lanterns required on Engines.)

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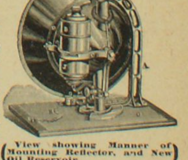

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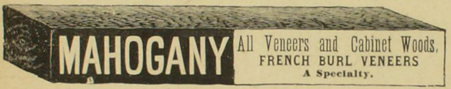

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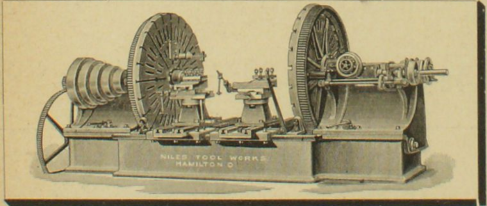

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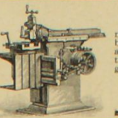

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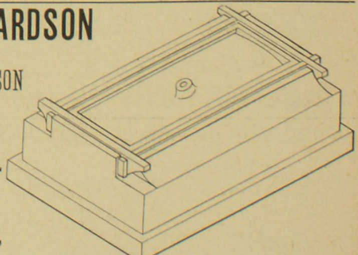

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